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The Problem of the Subnormal in the Community*

B. T. McGHIE, M.D.
Deputy Minister of Health, Ontario

THE problem of the subnormal in the community is one which has been receiving an increasing amount of public attention in recent years.

In many popular discussions, however, the difficulty of the problem, which is already great enough, has been considerably increased by an apparent confusion of the terms "mental defect" and "mental disease."

In order to avoid any such confusion in our present discussion, it may be well to begin by emphasizing the very important distinction which exists between these two conditions. Mental defectives are not mentally ill—and the mentally ill are not mental defectives. They constitute two quite separate groups; they present quite different problems; they must be dealt with in quite different ways. Thus the distinction between them becomes a matter of definite practical importance.

An analogy may serve to clarify this difference. We have no difficulty in distinguishing between people who are physically sick and people who are physically short. The former are physically *abnormal*; the latter are physically *subnormal* in respect to height. Now the mentally ill, those persons with mental diseases, are mentally and emotionally sick. Mental defectives, on the other hand, are simply short—short in mental ability—short in that particular characteristic we call "intelligence." They may be, and in most cases are, perfectly healthy both physically and mentally. They are simply subnormal—below the average in "mental stature."

Before proceeding with our discussion of mental defect, it should be noted that these mental defectives constitute only a small proportion of the patients

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in our mental hospitals. In Ontario, only one of our twelve mental hospitals is devoted exclusively to the care and training of these cases. The others are concerned with the treatment of the mentally ill—people who are intellectually normal or even superior, but who are emotionally sick. Thus, mental disease presents a quite different but much more serious problem than does mental defect.

GENERAL NATURE OF MENTAL DEFECT

It is to mental defectives and to them only that the terms "subnormal" and "feeble-minded" should be applied. These are persons suffering from some degree of intellectual inferiority. This subnormality of intelligence exists at birth and remains unchanged throughout life. But all mental defectives do not show the same degree of deficiency. If you take any large group of persons you will find that the individuals in that group differ from one another in their ability or intelligence just as they differ in height. Some of them will be "short". But just how high is a "short" person? Obviously there are no clearly marked divisions between the short, the average and the tall persons in the group. In the same way, there are no clearly marked divisions between the mental defective, the normal and the superior persons. Each group blends imperceptibly into the next and any divisions which are drawn are purely arbitrary.

From this it should be apparent that the feeble-minded are not a distinct group; that they are not a different kind or type of human being; that they simply lack in more or less degree that characteristic which may be described as the ability to behave intelligently. They range all the way from the almost totally helpless idiot to the high-grade moron of perfectly normal appearance who can, and in most cases does, carry on as a normal and useful citizen.

CAUSES OF MENTAL DEFECT

There are many different causes of feeble-mindedness. Much remains to be discovered about the factors which are responsible for mental defect, but it is known that, in certain cases, the condition is due to glandular disturbances; in others, it is due to abnormal physical conditions in the mother during pregnancy with resulting disturbance of the pre-natal environment; in still other cases, mental defect is the result of birth injuries or gross damage to the brain after birth. "Contrary to what is often supposed, neither alcoholism nor syphilis in the parents appear to be important causal factors in producing mental defect in offspring."

The important point, however, is that there are many different causes of mental defect. Much confusion has resulted from the unwarranted assumption that there is only *one* cause of feeble-mindedness; namely, feeble-minded parents. The fact is that feeble-minded parentage appears to be a significant factor in less than half—probably no more than one-third—of the cases of mental defect which have been carefully studied.

One reason for the popular notion that most, if not all, mental defectives inherit their defect from their parents, is our tendency to be impressed by

specially selected family histories which purport to show how mental defect has persisted and multiplied through several generations. From a scientific point of view, such "family trees" as those of the famous Kallikaks and Jukes are evidence merely of the extent to which misguided enthusiasm may supplant factual information. The solemn diagnosis of mental defect in a great-great-grandfather on the basis of third-hand hearsay gossip would be amusing if it were not so misleading. Such myths regarding the supposed fruits of certain alleged family trees should be regarded with the skepticism they deserve.

EXTENT OF THE PROBLEM

That the subnormal in the community constitutes a serious problem needs no emphasis. Just what the extent of that problem is, can be readily determined. Although the exact number of mental defectives in our Province is not known, careful surveys of large populations elsewhere provide a reliable basis for calculating that there are between 60,000 and 70,000 mental defectives living in the Province of Ontario to-day. Since only about 2,000 of these are to be found in our institutions and less than 5,000 others have been identified in the community, it is interesting to note the very significant fact that at least 90 per cent. of our mental defectives are able to carry along in the community without ever being recognized as such either by institutional authorities or by social agencies.

Any reference to the number of mental defectives in the community is bound to raise the question of whether mental defect is increasing in frequency. One hears it said that mental deficiency is increasing at an alarming rate; that mental defectives tend to have much larger families and propagate more rapidly than do persons of normal intelligence. It has even been suggested that the eugenic salvation of the race depends on the immediate curbing of the menace of mental deficiency.

What then are the facts? In a recent extensive scientific investigation* of this whole question it was conclusively demonstrated that the families in which mental defectives occur are *not* larger than the average for the general population; that mental defectives themselves have much *less* than the average number of children; that for mental defectives, the birth rate is lower, the marriage rate is lower and the death rate is higher than for the general population. There is no valid evidence for supposing that mental deficiency is increasing in frequency and there are no grounds for sensational alarm concerning the salvation of the race in respect to the subnormal.

It is, of course, true that there are more mental defectives in institutions to-day than there were years ago. It is also true that many of us in the course of our work in the community believe that we are encountering an increasingly large number of them. This does not mean that mental defectives are on the increase. It simply means that we have improved our methods of diagnosis, that we have extended our facilities for treatment, and that we are more conscious of the importance of this factor in community adjustment.

**Eugenical Sterilization; a Reorientation of the Problem*, by the Committee of the American Neurological Association for the Investigation of Eugenical Sterilization. Macmillan, New York and Toronto. [Reviewed in this issue; see page 152.]

PROPOSED SOLUTIONS

Registration

One of the earliest proposals was the suggestion that the entire population should be carefully surveyed and examined in order that all mental defectives could be identified and their number, location and condition made known to the authorities. It soon became apparent that simple identification of mental defectives would serve no useful purpose whatever since it would be both impossible and unnecessary to do anything about the large majority of them.

Segregation

Linked with the idea of registration was the notion that mental defectives should really be removed from the community and placed in suitable institutions. The sheer economic impossibility of any such grandiose scheme gradually became apparent. For example, in Ontario, if we disregard entirely the capital cost of building institutions, it still costs the Province one-half million dollars per year to maintain 2,000 mental defectives in institutions. Even if additional institutions could be obtained without expense, the segregation of all mental defectives in Ontario would increase this maintenance cost to more than fifteen million dollars annually. It is evident that, even if it were desirable, the institutional segregation of mental defectives is simply not practicable.

Sterilization

A more recent proposal is that of eugenic sterilization of mental defectives. As you know, this has become a highly controversial subject. For many people it involves not only scientific issues, but religious and moral issues as well. It should be clearly understood that anything I have to say on the subject will be strictly limited to the scientific issues involved.

The first requirement is to be sure that we are clear as to what is being discussed. Unfortunately, eugenic sterilization has sometimes been proposed as a sort of cure-all with which to eradicate most of society's ills. It has been proposed in connection not only with mental defect but also with mental disease, criminality, immorality and a variety of other conditions which are often lumped together indiscriminately. Discussion without definition is futile. Our present discussion is limited to the question of the sterilization of mental defectives.

The sterilization of mental defectives has sometimes been advocated on the grounds that mental deficiency is increasing at an alarming rate, and that sterilization would serve eventually to eliminate this undesirable strain from the population. Neither of these arguments is valid. In the first place, as has been noted above, there is no evidence that mental defectives are increasing in number. In the second place, feeble-minded parentage is by no means the only cause of mental defect and it is obvious that sterilization would have no effect on the large proportion of cases born to normal parents. Frankly,

I see no reason to fear that, without sterilization, mental defectives will swamp the population, nor do I see any reason to hope that, with sterilization, the problem of the subnormal will be solved.

In ridding ourselves of exaggerated fears and false hopes concerning sterilization, we should not conclude that this procedure would have no practical value. While recognizing that sterilization is no panacea, we should also recognize that there are valid scientific reasons for giving serious consideration to some form of voluntary selective sterilization. For example, it must be admitted that successful parenthood and the effective training of children are tasks calling for no small measure of ability. It is not difficult to demonstrate that many mental defectives are unable to provide for their children the sort of environment or the type of training which will be likely to produce socially desirable citizens.

The limitations of mental defectives, as parents, become increasingly apparent as the size of their family increases. In many cases they are able to carry on satisfactorily in the community while their family is small. Many of them are able to maintain a healthy, happy and economically independent home under these circumstances. Yet with increase in size of family, the economic burden becomes too heavy, the home situation deteriorates, and eventually the entire family may become a charge on the state, either through relief or institutionalization. In such cases, other methods such as birth control would not prove very effective because of the limited intelligence of the parents, whereas allowance for voluntary sterilization before the economic burden becomes too heavy might enable such families to continue as satisfactory and self-supporting units of society.

It may be added that there appears to be little ground for the objection that sterilization would encourage immorality and promiscuity. It is doubtful whether the prospect of children is given much consideration by mental defectives in any case, and the removal of this possibility would probably have little bearing on their behaviour. Securing acceptable social and moral behaviour is primarily a problem of proper training and adequate supervision. It is no more difficult to supply these for mental defectives than for normals.

While it may be granted that some type of selective voluntary sterilization would be of practical, if limited, value, it must also be admitted that the problem of the subnormal cannot be solved by this or any other simple procedure. Mental defectives cannot be legislated out of existence, nor can they be institutionalized.

Training and Supervision

We must face the fact that the only promising line of attack on the problem of the subnormal is special education and community supervision. It must not be thought that the training of mental defectives is either a hopeless or worthless procedure. The feebleminded, no matter how defective, are never "ineducable". They can be, and are being, made both useful and happy through special education. Except in a very few cases, this special

training does not require institutionalization. In most cases they can be most satisfactorily trained right in the community and in their own homes.

The special education of mental defectives in the community does not mean simply special academic training in so-called auxiliary classes although such classes do offer many of them their first opportunity to learn in a healthy fashion those few academic skills which will be of real use to them. Nor does it refer simply to the acquisition of those occupational skills by which they may later earn their living. More important than either academic or occupational training is that broad social education which depends, largely, on the leadership and initiative of our social agencies and educationalists.

The only mental defectives who constitute serious community problems are those who have failed to learn how to live in a socially acceptable manner. It must be remembered that mental defectives are not the only ones who sometimes fail to learn this lesson. There are others of normal, and many of superior intelligence who have similarly failed and who require that very difficult type of social re-education called "reformation". It is of the utmost importance to recognize that the social re-education of the defective delinquent is precisely the same problem as the social re-education of any other type of delinquent. They are no harder and no easier to reform.

A quarter of a century ago it was thought that mental deficiency was a major cause of crime and delinquency. Surveys of reformatories and prisons revealed that a larger proportion of mental defectives were to be found among the inmates of such institutions than in the general population. From this, it was concluded that, in many cases, crime was due to mental defect. It became popular to attribute vice, immorality and incorrigibility to the mental defective.

Among those who have had direct experience in working with large groups of mental defectives, such superstitions as these have long since evaporated. We now know that mental defectives do not tend to be vicious, immoral, brutal or criminally inclined. It is recognized that mental defectives are found in reformatories and prisons with disproportionate frequency, not because mental defectives tend to be criminals, but because mental defectives tend to be caught. Like the rest of us, mental defectives need to be taught how to behave in a socially acceptable fashion. It is simply because society has so often failed to provide anything in the way of suitable social training that mental defectives have gained their ill repute.

There is an unfortunate tendency on the part of social workers and others to assume that, having determined the presence of mental defect in a delinquent, they have explained the delinquency. But delinquency occurs in a mental defective for precisely the same reasons that it occurs in a normal person. It does not follow that the mental defective should go to an institution. It does follow that whatever social treatment is indicated in the one case is also indicated in the other case. We are unduly impressed with the mental defectives who are brought to our attention because they have got into difficulties. It is therefore important for us to remember that at least

95 per cent. of mental defectives are never brought to our attention at all because they do *not* get into difficulties.

It has been possible for us, through our mental health clinics, to demonstrate clearly the feasibility of community training and supervision for mental defectives. As one part of their work, the clinics have, in the last six years, supervised the home training of some two thousand mental defectives in Ontario. It has been of particular interest to note the marked change in attitude on the part of parents as a result of this supervised home training program. In many cases, the parents, when first seen by the clinic, were simply frantic to have their child admitted to Orillia because of the harmful influence the defective child was having on other members of the family or because the mother's health was breaking under the strain imposed by the untrained and uncontrollable defective child. These same parents are now so pleased with their own success in handling the problem that they would not for a moment consider allowing the child to be placed in an institution. Just recently in one small town in Ontario, where there are a group of fifteen of these defective children on a supervised home training program, the mothers concerned gave a tea and bazaar at one of the homes in order to exhibit to each other and to their friends the progress made by these retarded children.

Naturally, we have found that the co-operation of the parents is not always easy or even possible to secure and that without such co-operation little can be accomplished in the way of effective home training. However, the really surprising aspect of the experiment has been the amount of very real success achieved and the extent to which parents and others in the community can solve this problem of the subnormal if given a concrete program to follow and special advice when difficulties arise.

In conclusion, then, the problem of the subnormal appears to be essentially a community problem—one which must be faced and dealt with in and by the community.

Vital Statistics at the Service of Public Health and the Medical Profession*

EUGENE GAGNON, M.D.

*Superintendent, Division of Vital Statistics
Department of Health, Montreal, Quebec*

IN his inaugural address to the first meeting of the section in 1930, Dr. R. H. Coats, first Chairman of the Section of Vital Statistics of the Canadian Public Health Association, compared vital statistics to the balloons used by armies to seek the position of the enemy and thus to give proper direction to the artillery. This simile offers a striking picture of the part played by vital statistics whose mission is to signal to the hygienist and the clinician the dangers menacing public health and to indicate the diseases most prevalent. It also permits one to judge the efficacy of methods employed to combat diseases. Vital statistics, indeed, guide the action of all those engaged in the fight against disease.

In order to be in a position to give information to the hygienist and to the clinician, the statistician must gather, classify, and analyse data concerning population, marriages, births and deaths. This is called demography. The discussion in this paper is limited to mortality records alone.

THE COLLECTION OF STATISTICAL DATA

Mortality data are therefore supplied on a statistical return of deaths which must be completed in each case and deposited with the competent authority before burial can proceed. Data concerning the name, age, sex, civil status, race, occupation, residence, place of death, etc., are to be supplied and that portion of the certificate filled in by the depositaries who, in Quebec, are the ministers of the Church and the superintendents of the hospitals and public homes.

A second part of the form is reserved for the use of the attending physician in certifying the cause of death. This section must be filled in with the greatest care because the death is classified according to the information therein given. It is of great importance also that the other questions on the certificate be answered accurately as the data not only serve to identify the disease but are of value in assessing the influence of these factors upon the evolution of disease.

Nearly all death certificates in use ask two questions, the wording of which may be somewhat different from country to country but all of which have about the same meaning. They are expressed thus: *primary and secondary cause; principal and contributory cause; cause of death and contributory cause, etc.*

*Presented at a meeting of l'Association des Médecins de Langue Française de l'Amérique du Nord, Montreal, September, 1936.

In some countries only one question is asked and the attending physician is requested to give only one cause of death. Experience proves that in many instances what is given as the cause of death under these circumstances is only a syndrome developing at the terminal period of a primary disease; for instance, uraemia, oedema or congestion of the lungs, which are frequently met in connection with cardiac or renal diseases, etc. It is therefore very important to go back to the origin of such syndromes and it was with this in mind that the new Canadian death certificate was introduced in 1935. The phraseology used on this form is practically identical with that adopted in 1927 in England and Wales, where it has proved satisfactory.

Two main questions are asked on the medical section of the new death certificate: the first is intended to obtain from the attending physician the underlying cause of death by starting (if desired) with the terminal phase of the disease and going back to its origin. The wording is as follows:

CAUSE OF DEATH

I	
Immediate cause	(a)
Give disease, injury or complication which caused death, not the mode of dying, such as heart failure, asphyxia, asthenia, etc.	due to
Morbid conditions, if any, giving rise to immediate cause (stated in order, proceeding backwards from immediate cause).	(b) due to (c)
II	
Other morbid conditions (if important) contributing to death but not causally related to immediate cause .	{

Supposing that the immediate cause of a death is given as uraemic coma, the disease causing uraemia must be indicated. The two sub-questions (B) and (C) serve to elicit such data in order proceeding backwards, i.e., from the last to the first cause, as indicated by the words "due to" preceding each sub-question.

For the hypothetical case above mentioned, we could have:

I	
Immediate cause	(a) uraemic coma
due to	(b) acute nephritis
due to	(c) scarlet fever

Such a certificate of death would be classified as scarlet fever because there is a direct relation between the three causes mentioned, the first and second being an immediate sequence of the third. On the contrary, if the wording of the death certificate was as follows:

I	
Immediate cause	(a) uraemic coma
due to	(b) chronic nephritis
due to	(c) scarlet fever in infancy

the death would be classified to chronic nephritis, because in such a case many factors other than scarlet fever might have modified the conditions of the kidney and there is no longer any reason to attribute the death to that disease.

The second question asks for "other morbid condition (if important) contributing to death but *not causally related to the immediate cause*". The words "if important" must be kept in mind, and whenever there is no other serious morbid condition question II *must* be left unanswered.

All the questions which appear on this statistical return are important and must be answered with the utmost care. The superintendents of hospitals and homes for the poor should endeavour to obtain all the needed information when the inmates are admitted into their institution. When it is impossible to give an answer to a question, the space should not be left blank, but an indication given that it is impossible to obtain the information.

THE CLASSIFICATION OF THE CAUSES OF DEATH

The causes of death are classified by the statistician according to the International List of Causes of Death which is now employed in all civilized countries. This list was adopted at the beginning of the twentieth century and has therefore been in existence for 35 years. Before that, each country or city had a list of its own which was more or less at variance with that of its neighbours. As there was no common basis, the statistics of one country could not be compared with those of others.

In general, we cannot classify diseases strictly according to their nature or etiology because many of them are not as yet sufficiently known. Further, the terms by which diseases are designated are liable to change as medical science evolves; and since the nosological list of diseases contains thousands of names, it would be impracticable to publish tables in which each disease was referred to by its own name. In the general outline of the list, therefore, the diseases are designated according to their anatomic site. That is the basic principle which was employed by Dr. William Farr in England in 1839.

But besides diseases which concern one particular organ, there are others affecting all the organs of the body. These were originally grouped together under the title of "General Diseases" in the International List of 1900, with sub-divisions for the well-defined infectious diseases such as typhoid fever, measles, tuberculosis, etc., cancers and tumors of various organs, rheumatism, diabetes, diseases of the blood and poisonings.

Provision has been made for the revision of the International List every ten years. When the latest revision was effected in 1929, the first group of 1900 was divided into five groups, with the following headings:

- I. Infectious and parasitic diseases.
- II. Cancer and other tumours.
- III. Rheumatic diseases, diseases of nutrition and of endocrine glands.
- IV. Diseases of the blood and of the blood-forming organs.
- V. Chronic poisonings and intoxications.

The number of sub-divisions for these five groups was increased from 59

to 77. At the last revision the *total* number of sub-divisions was 200, and the remaining 123 of these are divided amongst 13 other major groups or classes. These latter are:

- VI. Diseases of the nervous system.
- VII. Diseases of the circulatory system.
- VIII. Diseases of the respiratory system.
- IX. Diseases of the digestive system.
- X. Diseases of the genito-urinary system.
- XI. Diseases of pregnancy, childbirth, etc.
- XII. Diseases of the skin and cellular tissue.
- XIII. Diseases of the bones and organs of locomotion.
- XIV. Congenital malformations.
- XV. Diseases of early infancy.
- XVI. Senility.
- XVII. Violent or accidental deaths.
- XVIII. Ill-defined causes of death.

These eighteen classes or groups of diseases subdivided into two hundred specific headings are the skeleton into which are inserted the thousands of expressions found in the nosologic vocabulary. In the course of each revision of the list, the International Commission makes a list of the new causes of death which are to be added and assigns a place to each of them in one or other of the groups of the general list. The International Commission publishes also a manual of the International List with an alphabetic index, indicating after each disease or designation the number of the list to which it is assigned.

When there is only one cause mentioned on the death certificate, such as measles, acute endocarditis, chronic nephritis, etc., the classification is easy and purely clerical. Such cases are exceptional, however, multiple causes usually being recorded. As classification can be made to one cause only, the statistician is forced to make a selection and thence trouble begins in classification.

THE RULES OF PREFERENCE WHEN MORE THAN ONE CAUSE OF DEATH IS MENTIONED

In order that more uniformity in classification might be obtained, Dr. Jacques Bertillon in 1903 published tables indicating which titles of the list were to be given preference over others when multiple causes were stated on the medical certificate. For example, when measles is mentioned with scarlet fever or diphtheria, preference is given to the latter; on the other hand, measles would have preference over whooping cough, influenza, bronchopneumonia, and many other diseases. Whenever there are more than two causes mentioned, a process of elimination is to be resorted to.

Such tables are very handy because with them classification is made somewhat in a mechanical way. However, since they lack elasticity and do not allow for circumstances accompanying the death, they are really only a makeshift. The United States Bureau of Statistics at Washington has continued the publication of such tables with slight modification, adapting them to each revision of the International List as it appears. The International Commission, while admitting that such tables are very useful, has not attempted to lay down any fixed practice.

In Canada, the Dominion Bureau of Statistics follows in general the rules published in the English Manual. The order of preference is as follows:

- I. Accidents and violences.
- II. Epidemic, endemic, infectious and general diseases, specifically nominated in the list.
- III. Local diseases.
- IV. Ill-defined causes of death.

Accordingly, accidents are preferred to any other cause of death, exception being made in those instances of a slight injury which would not prove fatal in a healthy person. Epidemic and infectious diseases are next in order of preference and those which are naturally severe are named separately in the list. However, all diseases of bacterial origin are not of the same severity and in English practice they are divided accordingly into four groups. In each of these groups are also included certain general diseases and a few local diseases which are of a serious nature, such as cancer, strangulated hernia, general paralysis of the insane, tabes dorsalis, etc. On the other hand, rheumatism, diabetes, and the diseases of the endocrine glands and of the blood are given preference over local diseases but not over those of an epidemic nature.

Of the local diseases, the following have preference: malignant endocarditis, lobar pneumonia, enteritis, appendicitis, cellulitis, and certain diseases of the nervous system. After them, preference is given to the well-defined diseases of the heart and the kidney which are in turn preferred to the diseases of the respiratory system. Between the chronic diseases of the circulatory and urinary systems the order of preference is as follows: angina pectoris, endocarditis, nephritis, arterio-sclerosis, and myocarditis, which are also preferred to cerebral haemorrhage, paralysis, etc.

The above illustrations do not cover the whole field but they are sufficient to indicate broadly the procedure followed in classifying deaths when more than one cause is mentioned and serve to demonstrate the difficulties met by the statistician. On the other hand, being forced to classify to one cause only, it is necessary to overlook many clinical facts actually revealed by the death certificate.

HOW FREQUENT ASSOCIATED MORBID CONDITIONS COULD BE SHOWN IN STATISTICS

Vital statistics could render a still greater service to the clinician if provision was made to tabulate the more frequent associated diseases and complications. Tables were published in 1929 by the Dominion Bureau of Statistics showing the frequency of associated morbid conditions and it is hoped by the Dominion Bureau that such publications may be issued at intervals. In diabetes, for example, it is known that when Insulin is properly administered diabetic coma can be avoided. It is therefore important to know how many diabetic cases end in coma. On the other hand, in persons over 50 years of age (and sometimes younger) diabetes is frequently associated with degenerative disease of organs of the circulatory and urinary systems. Rules for classification, however, give preference to diabetes over these diseases, and hence they do not appear in published reports.

To illustrate this point, the data in table I were obtained from 203 death certificates in Montreal assigned to diabetes.

TABLE I
ASSOCIATED MORBID CONDITIONS IN 203 DEATHS FROM DIABETES
Montreal, 1935

	Number	Per cent.
Simple diabetes (no complications mentioned).....	9	4.4
Diabetes with coma.....	27	13.3
Diabetes with gangrene.....	36	17.8
Diabetes with other diseases of the circulatory system.....	50	24.6
Diabetes with diseases of the urinary system.....	23	11.3
Diabetes with cardio-renal complications.....	15	7.4
Diabetes with various complications.....	43	21.2
Total.....	203	100.0

TABLE II
MORBID CONDITIONS ASSOCIATED WITH DEATHS ATTRIBUTED TO CERTAIN CAUSES
City of Montreal—Vital Statistics for the Months of
January, April, July, and October, 1935

Suggested Subdivisions	Number of deaths	Per cent. of total
<i>No. 92—Chronic Endocarditis</i>		
(A) Rheumatic origin.....	25	19.7
(B) Specified as chronic.....	17	13.4
(C) Unspecified as chronic.....	29	22.8
(D) Associated with myocarditis and arteriosclerosis.....	32	25.2
(E) " " nephritis.....	18	14.2
(F) " " cerebral haemorrhage.....	6	4.7
Total.....	127	100.0
<i>No. 93B—Chronic Myocarditis</i>		
(A) Rheumatic origin.....	8	5.6
(B) Associated with cerebral haemorrhage, embolism or thrombosis.....	7	4.9
(C) Specified as chronic.....	89	62.3
(D) Unspecified as chronic under 45 years.....	2	1.4
(E) Unspecified as chronic over 45 years.....	37	25.8
Total.....	143	100.0
<i>No. 95—Other Diseases of the Heart</i>		
(A) Cardio-renal.....	17	63.0
(B) Associated with cerebral haemorrhage, embolism or thrombosis.....	7	26.0
(C) Rheumatic heart disease.....	3	11.0
Total.....	27	100.0
<i>No. 97—Arteriosclerosis</i>		
(A) Associated with cerebral haemorrhage, embolism or thrombosis.....	51	38.1
(B) " " heart diseases (Nos. 93B and 95).....	51	38.1
(C) " " other diseases.....	32	23.8
Total.....	134	100.0
<i>No. 131—Chronic Nephritis</i>		
(A) Associated with cerebral haemorrhage, embolism or thrombosis.....	43	15.0
(B) " " myocarditis.....	66	22.9
(C) " " arteriosclerosis.....	15	5.2
(D) " " cardio-vascular diseases.....	24	8.3
(E) " " uraemia or coma.....	100	34.7
(F) " " rheumatic heart disease.....	4	1.4
(G) Simple or with other associations.....	36	12.5
Total.....	288	100.0

Some of these deaths assigned to diabetes undoubtedly were caused by one or other of the associated conditions mentioned. The same may be said in the opposite sense for cerebral haemorrhage which, on account of the low order of preference assigned to it, is often concealed under diseases of the circulatory and urinary systems.

In many deaths from chronic heart disease, rheumatic fever is the underlying cause but no provision is made in vital statistics to show this rheumatic origin. The Vital Statistics Section of the Canadian Public Health Association has suggested that this defect be corrected by the provision of a separate rubric for heart diseases of rheumatic origin. Such a change would cause a break in the continuity and comparability of mortality statistics. However, the same objective could be accomplished on a broader basis by adding sub-titles to the numbers now used. The data in table II, based upon a partial compilation of the deaths classified under certain titles in 1935, illustrate the method.

From these more detailed statistics it is seen that rheumatic fever appears on one out of five certificates in which the death is classified to chronic endocarditis. Cerebral haemorrhage, embolism and thrombosis, paralysis and hemiplegia, are associated with 38 per cent. of the deaths classified to arteriosclerosis and with 26 per cent. of those classified to chronic nephritis.

These two examples show how useful it would be to introduce into the International List such a type of sub-title and to indicate such associated morbid conditions. A step has already been made in this direction in the provision of sub-titles under influenza to show pulmonary and other complications. I believe that some thought should be given at the next revision of the International List in 1938 to a similar provision for recording associated morbid conditions in other diseases.

HOW THE ATTENDING PHYSICIAN CAN ASSIST THE STATISTICIAN

No amount of statistical effort will produce the desired results unless the physician completing the death certificate indicates clearly what is, in his opinion, the cause of death, such as is now possible with the new death certificate. Every physician should make himself familiar with the International List and follow the instructions published by the Dominion Bureau of Statistics in the Physician's Handbook on Death Registration and Certification. On page 18 of this booklet will be found the titles of the 18 groups into which the International List is divided and on the following pages the 200 separate titles composing the International List. Suitable explanatory notes are supplied concerning certain of the terms which will avoid confusion on the part of the physician in stating the cause of death. The form of the new death certificate is of definite assistance in the effort to avoid unsatisfactory expressions and to make the statement of death more specific.

The physician must remember that (at present, at any rate) we can assign a death to one cause only and that he is expected to mention the principal cause under Section I of the form, showing, if desired, the various phases of the

illness by starting at the terminal phase and going back towards the underlying cause or origin. He must remember also that whenever there are other *important* illnesses contributing to the death, these must be mentioned only in part II of the form.

I

Immediate Cause

- (a) bilateral broncho-pneumonia.
due to
- (b) toxic-infectious nephritis,
due to
- (c) myocarditis, aortic stricture and insufficiency.

II

Other morbid conditions

Diabetes.

This kind of certificate is confusing, because the relation between cause and effect is not clear. In this case, none of the diseases were mentioned as being acute or chronic. Is the nephritis the "cause" of the broncho-pneumonia, or the reverse? Specific indications being lacking, one may suppose that these two diseases were acute, but myocarditis and aortic stricture and insufficiency are chronic conditions and, in all probability, they are not related to the toxic-infectious nephritis nor the acute broncho-pneumonia, because in such instances we would rather expect a passive congestion of the lungs and other organs due to failing circulation of the blood. Taking into account the rules of preference, we have assigned this death to diabetes but we doubt very much if this was the underlying "cause of death". The statistical records added a death from diabetes but have probably lost one from heart disease.

CONCLUSIONS

1. Statistics of deaths from violence, infectious diseases, cancer, diabetes, diseases of the blood and other general diseases, owing to the operation of the rules of preference, may be considered accurate, at least so far as such conditions are mentioned on the death certificate.

2. Statistics of local or organic diseases are still imperfect owing to the numerous associated morbid conditions encountered, but it would be possible to improve this state of affairs by making modifications in the International List that would bring out these features.

3. In order that statistics may render to public health and to the clinician the service rightfully expected, it is necessary that the certificates of death be completed by physicians in such a way that the principal or underlying "cause of death" is clearly evident.

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Typhoid Carriers Among 7,000 Food Handlers*

JAMES R. SCOTT, M.D., PH.D.
University of New Mexico, Albuquerque

SOME years ago the attention of the members of the County Health Department became centred upon the problem of possible typhoid carriers among food handlers. Having had the experience of a milk-borne epidemic of typhoid fever which was traced to the presence of a single carrier among the employees producing milk for one of the larger dairies serving the community, we wondered whether typhoid carriers might not exist among food handlers other than those engaged in milk production and distribution. When this question was asked of others engaged in public health work, we were told that perhaps typhoid carriers existed among other food handlers, but they were of so little menace to the public health that the expenditure of effort and finances required for their detection would not be justified. Nevertheless, the question interested us, and accordingly, we began a quiet campaign of education among the food handlers of the community, and the collection of specimens of the intestinal discharges for laboratory examination. This work was continued for a period of years, until we were forced to discontinue the endeavour, on account of the crowded condition of the State Public Health Laboratory and financial inability to employ additional personnel to carry on this investigation.

Some 7,040 specimens had been collected from various classes of persons engaged in handling food in its various forms. Since there was no compelling law whereby the co-operation of the proprietors of food-handling establishments might be required, the actual numbers of specimens submitted by the various groups of food handlers vary considerably. Naturally since milk production was controlled by the provisions of the dairy ordinance, the best co-operation was given by dairy and creamery workers of the various grades.

We find that 2,138 dairy employees submitted specimens for laboratory examinations. Of these, 2,070 were found to be negative for *B. typhosus*, while 105 were received in a condition unsatisfactory for bacteriological examination. Seven persons applying for employment in dairies were found to be excreting typhoid bacilli in the intestinal discharges. When expressed as a percentage, the number of positive typhoid carriers detected in this series amounts to the apparently insignificant figure of 0.32 per cent. However, when it is considered that milk is an exceptionally fine medium for the growth of typhoid organisms, one shudders to think of the danger to the milk-consuming population had these seven carriers been permitted

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employment in dairies. Many epidemics have been reported which have been traced to the employment of a single typhoid carrier in a dairy. While the number of typhoid carriers among dairy workers found in our study may appear absurdly small, the detection and exclusion of these carriers from milk handling has been a valuable means of safeguarding the health of the citizens of this county.

The menace of the typhoid carrier in cafés, restaurants, hotel dining rooms, and other types of eating places is usually considered to be somewhat less than that presented by the carrier working in a dairy. However, it must be recalled that many types of food served to the patrons of eating establishments are prepared and served without being cooked to a degree which insures sterilization of the food. Furthermore, many salads, desserts, and certain types of pastries are not exposed to heat after being prepared. Therefore, we were interested in ascertaining how frequently the carrier condition occurred among cooks, dishwashers, saladmen, and waiters and waitresses employed or seeking employment in our local cafés and restaurants. Since there existed no laws or ordinances requiring an employee of an eating establishment to obtain a food handler's health certificate before accepting employment, we were forced to rely upon education and persuasion to bring about a degree of co-operation.

Food handlers to the number of 2,327 submitted specimens of the intestinal discharges for laboratory study. Of these, 2,188 proved negative on examination, 132 were found to be unsatisfactory for examination, and 7 were found positive for *B. typhosus*. As a result of our efforts in this direction, 7 persons were excluded from occupations connected with the preparation and serving of foods to the public. It is again difficult to state the exact degree of protection afforded the public by this exclusion but it is well known that outbreaks of typhoid fever have been definitely traced to infected foods.

We considered that the attendants at soda fountains might present a menace to the public. Accordingly, we attempted to enlist the co-operation of this class of food and beverage handler, but with somewhat indifferent results. We finally did obtain some 440 faecal specimens from soda fountain employees. Of this number, 424 were negative for *B. typhosus*, while in 16 cases the specimens were unsatisfactory for laboratory study. Soda fountain employees constituted the only group of the food and beverage handlers which failed to yield positive typhoid specimens. It is believed that, had the series of specimens been larger, some typhoid carriers would undoubtedly have been detected among this class of workers.

We entertained considerable doubt as to whether bakers and other employees of bakeshops, doughnut factories, pie shops, and similar establishments really constituted a menace to the public as possible typhoid carriers. We believed that, even were carriers demonstrated in this group, the temperatures attained in the process of baking would be sufficient to destroy the organisms. However, we recalled that cream puffs are filled with a custard preparation which is susceptible to contamination and which is not exposed to heat after being inserted into the puff. Likewise many cake icings and fillings are known to be capable of permitting the growth of some forms of

bacteria. Therefore we again enlisted the co-operation of 732 employees of bakeries in our study.

Of this number of bakery employees, 675 submitted specimens which were negative for *B. typhosus*, while in 53 cases the specimens were unsuitable for laboratory study. In this group of bakery workers, four persons were detected who were discharging typhoid bacilli in the intestinal discharges. This indicates that about one-half of one per cent. of these bakery workers were carriers.

The employees of many grocery stores and meat markets were likewise investigated, when these employees manifested a proper spirit of co-operation. No attempt was made to examine all grocery store employees, but our efforts were centred on those employees who handled meats and vegetables which, in the usual course of events, are consumed in the raw or uncooked condition. This very materially reduced the number of grocery store employees available for study. However, 629 employees of grocery stores and meat markets submitted specimens for examination. Of this number 578 were negative for *B. typhosus* while 50 specimens were unsuited to laboratory investigation. Here again, one typhoid carrier was detected. While one may wonder whether grocery clerks present a serious menace to the health of the public, it must be remembered that many types of meat and meat products, as well as many kinds of vegetables and some fruits, may conceivably be handled by a typhoid carrier and then be consumed without further preparation or cooking.

The final group of food handlers is called our miscellaneous group because of the fact that it includes many separate classifications, each of which contains a very small number. In this group we have placed such occupations as drivers of ice-cream-cone wagons, the vendors of hot tamales, and the pedlars of Mexican foods, as well as many persons who attempt to earn a livelihood through the preparation and sale of various food stuffs, as empanadas, cookies, doughnuts, breads, potato chips, and even shelled pinon nuts. It might be stated that in this irregular or miscellaneous group of food handlers there existed a fine spirit of co-operation. These people seemed early to develop the spirit of desiring to co-operate with the health department and to be able to exhibit to prospective customers the health card issued by the department. Accordingly we find that 749 persons submitted intestinal specimens for laboratory examination. Of this number 705 specimens did not show *B. typhosus*, while in 43 cases the specimens were unsatisfactory for laboratory examination and study. Here again, one typhoid carrier was detected in this group of miscellaneous food handlers.

Combining these various classifications, we find that 7,040 specimens were submitted to the laboratory for examination. Of this number, 6,621 proved to be negative for the presence of typhoid bacilli, while 399 specimens proved unsuitable for laboratory study and were discarded. This leaves 20 positive specimens, derived from 20 persons seeking employment as food handlers in the county, who were apparently in a normal condition of health and who undoubtedly would have been given employment as food handlers had this particular study and laboratory control of food handlers not been in practice at the time these 20 applied for food handlers' certificates.

When these figures are reduced to percentages, it is found that 94.9 per cent. of the specimens were negative for *B. typhosus*, that 4.8 per cent. were unsatisfactory for laboratory examination, and that 0.3 per cent. were positive for *B. typhosus*.

Another large class of persons employed in the handling of food, to which this study was not directed, are those employed as cooks and in the various forms of domestic service. It is impracticable to extend this type of study to cover the women who seek this type of employment because it involves so many individual places of employment. Many women seeking employment in such domestic service are not of the type which will voluntarily co-operate with the health authorities. The employers of domestic servants, cooks and similar persons have not been sufficiently educated to demand that the applicant for employment present a food handler's health certificate as a condition precedent to such employment. That these persons employed in domestic service constitute a menace to the members of the household in which they are employed, is amply evidenced by the data which have accumulated. The trail of "typhoid Mary" is familiar to every student of hygiene. We have had a few instances in Albuquerque homes where typhoid fever has been traced directly to a typhoid carrier who was employed as a cook or in some other form of domestic service. Such employees constitute a group which is extremely difficult to study and control.

An objection frequently raised against this practice of examining intestinal specimens from prospective food handlers is that it is exceedingly expensive in proportion to the positive results obtained. While I do not have any cost estimate for this type of examination from the New Mexico State Public Health Laboratory, such a cost study has been made by the Bureau of Laboratories of the Connecticut State Department of Health. In Connecticut (1), the cost per examination has varied during the years from 1927 through the first eight months of 1933 from a low of 49½ cents to a high of 57 cents. Connecticut has had an experience somewhat similar to ours in Albuquerque, of finding from 1 to 27 carriers per year. Their series included the examination of 91,257 food handlers, among whom only 71 typhoid carriers were detected. This gives for Connecticut a percentage of 0.00077, which stands in marked contrast to the percentage of 0.3206 in Albuquerque. The Connecticut figures of total cost per typhoid carrier detected vary from a high of \$3,848 per carrier to a low of \$387 per carrier, with an average over the entire period of a cost of \$677 per carrier detected. It has frequently been questioned whether such a high cost of examination of food-handlers is justified.

What is the practical value of laboratory examinations in the control of food handlers? It is interesting and perhaps significant to discover that since this examination of the intestinal discharges of applicants for employment as food handlers has been a requirement, no epidemic outbreak of typhoid fever has occurred in Albuquerque or Bernalillo County. Furthermore, in the occasional sporadic cases of typhoid fever, some of which occur every year in this country, no case has been traced to the use of infected food. In sharp contrast stands the outbreak of 1922, during which more than 40 known

cases of typhoid fever occurred in the city of Albuquerque within a period of a few weeks. This outbreak was traced to the employment of a typhoid carrier in one of the larger dairies supplying milk to the city.

The Connecticut State Department of Health, in the annual report of its Bureau of Laboratories (1), states: "We believe that our data on food handlers other than milk handlers have not yet reached the proportions necessary for satisfactory evaluation of results." Yet in this period covered by the Connecticut study, 3,176 specimens were examined and 47 positive carriers of typhoid organisms were detected among food handlers other than milk handlers. This same observation may be applicable to our study, based on the examination of the 7,040 individuals, of which 2,183 were milk handlers, the remaining 4,857 being distributed among the many other classifications of food handlers. While this procedure entails a large volume of work with its attendant heavy cost, we are inclined to agree with the conclusion reached in the Connecticut report, namely: "A correlation of results obtained with the funds expended establishes the general utility and importance of routine laboratory examinations made periodically on important groups of food handlers in a central laboratory doing a large volume of work."

In sharp contrast stands the report on the "Advisability of Routine Laboratory Examination of Food Handlers", reported in the American Public Health Association Year Book, 1935-36 (2):

"Since 1915, a total of 565 typhoid carriers was discovered in New York City. Of this number, 308 were discovered as the result of epidemiological investigations made in connection with cases of typhoid fever, and 227 were discovered through stool examinations of patients after convalescence. In contrast to this, out of three and one-half million routine examinations of food handlers during the past 18 years, only 30 typhoid carriers were discovered. This is less than one out of each 100,000 food handlers examined. . . . Laboratory examinations of routine specimens from food handlers are not recommended, except from raw milk handlers."

By laboratory examination of the intestinal discharges of food-handlers one typhoid carrier has been found in each 100,000 examinations in New York City, as compared with 11 positive carriers in 3,176 examinations in Connecticut and 13 positive typhoid carriers in 4,857 examinations of food handlers other than raw milk handlers in the Albuquerque study. What may be the explanation of this diversity of results? It may rest in the fact that in a large city, such as New York, with excellent sewage disposal facilities, there exist fewer opportunities for persons to contract typhoid fever and to develop the carrier condition than may be found in rural areas, and particularly in such rural areas as exist in the southwestern United States, where often sanitary facilities are extremely rudimentary, or in some instances non-existent. Whatever may be the explanation of this diversity, we maintain that the detection of 20 typhoid carriers among 7,040 food handlers examined has potentially saved the community from serious outbreaks of typhoid fever.

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Supervision in Public Health Nursing*

ALICE AHERN, Reg. N.

Assistant Superintendent of Nursing

Metropolitan Life Insurance Company, Ottawa

IT is a recognized fact that the quality of public health nursing in any agency, whether public, private, urban or rural, is very largely dependent upon the amount and type of supervision available.

In an organization of any size there are usually three groups: the largest the staff, which is composed of those doing the productive work and without which there would be no need for the other two groups; the smallest, the administrative group, which formulates the policies and sets the objectives; and, between these two, the supervisory group, which acts as a medium between the staff workers and the Board and between the Board, the staff, and the public for whom the organization exists. This group serves also as a buffer or an interpreter, as the case may be, between the organization and the general public. The very nature of the three groups establishes the value, to the public and to the organization, of efficient supervision.

Supervision, properly created and maintained, assures the following important elements of public health nursing; namely, adequate technique, uniformity of procedure, essential records and reports, maintenance of up-to-date standards, an even quality of work, and staff education and efficiency. Is supervision needed? Yes. It is a mistake to say that nurses with a first-class preliminary education, a good basic training in nursing, and a university course in public health nursing, do not need supervision. Every nurse needs to learn. She needs help in special problems, she needs stimulating interest to keep her out of a rut, and she needs the detached judgment of the supervisor who helps her maintain a proper balance in her work.

In the early days of nursing associations, a group of nurses worked under a superintendent, but as the work increased and young women with very little experience were employed, more direction was needed. As a result, members of the staff who had shown initiative and administrative ability were promoted to be head-nurses and supervisors. They functioned largely as managers and inspectors, and most people even to-day still think of them as such. As the years passed and there was better organization of public health nursing, the function of the supervisor became better defined.

In services where there are two nurses, one of the nurses usually carries the responsibility of administration and contact with the Board. On a staff where there are five or six nurses the supervisor has the same responsibility. In addition, she organizes the work, directs the placing of cases, helps the nurses with their problems and supervises in the home—if she is not carrying

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too heavy a part of the case-load. She may also have to initiate new nurses into the work.

In large organizations where there is a director and the necessary number of supervisors for the size of the staff, each supervisor, whether located in the central office or in a district office, is responsible for her own group of nurses, and for a definite section of the area covered. Her work consists of assigning new cases, reviewing records, discussing and helping with problems, and making home visits according to the need of each nurse. The purpose of these home visits is not to inspect, but to obtain a better knowledge of the nurse's technique, her manner of teaching, and her general management of the case. As a rule, patients do not object to a supervisor's accompanying a nurse; they are rather pleased with the added attention, and if the supervisor has the right attitude, she will put everyone at ease. Throughout the visit she should not show disapproval of the nurse in any way, even though there may be serious cause for it, but later when alone with her, she should discuss the visit in detail, emphasizing the good points. Her criticism should always be constructive, showing the need for improvement in such a way that the nurse will realize that it is offered with a desire to help. She will be rewarded for her efforts by the fact that the nurse will be stimulated to improve. After all, unless the nurses are satisfied with the supervisor and look forward to her visits with them, the purpose of her work will not be attained.

A definite system of staff education through lectures and conferences is a part of the supervisor's work, unless the organization is fortunate enough to have an educational director. Some staffs have specialized supervisors who act as consultants, assisting in the continued preparation of the nurses for special phases of the work.

There is a type of supervision which is particularly important. It is the supervision of nurses who are working alone in a district, and to whom frequent supervisory visits are not possible. For these nurses the supervision given must be more concentrated than that given to those in cities and towns where there are regular staffs and other means of securing help and education. Many of these nurses are very isolated, not even having access to library facilities, and some of them are working under great difficulties.

Advance notice of the arrival of the supervisor should be given, in order that the nurse may be prepared for her visit, arrange her work accordingly, and have ready the problems and reports which she wishes to discuss. These visits should be looked forward to by the nurses as to the visits of a friend who brings news from other centres, help in solving problems, help in interpreting changes in technique and procedure and help with personal difficulties. Some nurses expect a supervisor to be a mine of information regarding what is going on elsewhere—meetings of the various nursing associations, refresher courses, what other nurses are doing; in short, everything they can think of, until the supervisor is apt to feel mentally and physically exhausted when she is ready to leave. All this implies that the supervisor is of the right type, that she has a definite aim, enthusiasm, kindliness, good health, plenty of vitality and the ability to get the best results from the material available.

While in the district she should make home visits with the nurse, as this is one of the best methods of stimulating her and of helping her to maintain her standards, and it also promotes a friendly relationship helpful to both.

A review with the nurse of a cross-section of her records and daily work-sheets, in conjunction with a study of the work accomplished since the last supervisory visit, will show the nurse whether she is controlling her work and has been putting sufficient emphasis on all its phases, or whether she has been giving too much attention to one. Contact with other organizations should be made with the nurse, and not independent of her, and she should be helped to solve her own problems instead of having them solved for her.

The field supervisor should obtain a clear-cut picture of each district in her territory, of its organization, its facilities for work, as well as its problems, and these should be supported by definite and comprehensive written reports. In view of the impossibility of making frequent visits to each district, some of her work will have to be done by correspondence. When doing this she should try to put a personal note into each letter, realizing that a letter can be interpreted in many ways, and that concluding with "kindest regards", or some other personal greeting, will help to lessen the formality.

Regardless of the type of organization to which she belongs, whether it be generalized or specialized, the function of the supervisor is essentially that of a teacher. She must teach the members of her staff really to believe in what they are teaching—not to try to eradicate superstitions among those with whom they are working, then touch wood before them for fear of bad luck; not emphasize to a group of children the necessity for hand-washing before meals and then wet her finger with saliva to turn over the pages of her note-book. She must make them understand the importance of finding out what those whom they are teaching know regarding health and hygiene, and what their economic status is before telling them what to do, and suggesting diets, etc. In a word, she must teach her staff to adapt their teaching to the mental, physical and economic capacity of those with whom they are dealing, as well as to their needs.

The supervisor is also responsible for the health of her staff and should be on the alert for physical cause which may be responsible for a decrease in interest and efficiency of any of the members.

Supervision has passed out of the pioneer period. It is a very vital necessity in the present-day system of public health nursing and can be summarized by the old saying that the supervisor should be a "guide, philosopher and friend" to her nurses. Tact and the right spirit will make the nurses look upon her as such. Once this relationship is established, supervision becomes simple and natural, its purposes are attained, and its cost justified.

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An Investigation of the Source of Arsenic in a Well Water*

J. WYLLIE, M.A., M.D., B.Sc., D.P.H.

Professor of Preventive Medicine, Queen's University, Kingston, Ontario

THE occurrence of arsenic in a well water is sufficiently rare to merit description. Most of the text-books on chemical water analysis give scant attention to or omit mention of its presence in drinking waters. Thus Mason and Buswell (1) say: "Arsenic occurs in some waters naturally, and both arsenic and chromium may be present from industrial waste. Should the presence of these elements be suspected, their determination should be undertaken, in the concentrated water, by the usual gravimetric methods." In Parkes' Practical Hygiene (7th ed., p. 78) the following example of arsenic gaining access to well waters from industrial waste is given: "In 1864 a factory at Basle discharged water containing arsenic into a pond, from which the ground and adjacent wells were contaminated, and severe illness in the persons who drank the well water was produced."

Berry (2) states that arsenic may occur in a shallow well from solution of arsenic insecticide sprinkled on neighbouring plant-life but, in a personal communication, he informs me that he has never met with a water contaminated in this way. Thresh (3) detected arsenic on one occasion in the water from a well situated in a garden adjoining a gravel path on which an arsenical weed-killer had been used. A considerable quantity of the water was evaporated before applying Marsh's test.

The presence of arsenic in mineral waters and in deposits from mineral waters has been reported many times. According to Weed and Pirsson (4) the waters of some springs in the Yellowstone National Park, U.S.A., contain sulphur and arsenic; and according to Hague (5) the deposits from the Norris Geyser basin contain sulphur, orpiment (As_2S_3), realgar (As_2S_2) and siliceous sinter. In table I a list of various thermal springs in the U.S.A. with their arsenic content is given. The analyses of the hot spring waters of the Yellowstone National Park were performed by Gooch and Whitfield, of the Norris Basin waters by Allen and Day, and of the hot and cold spring waters in California by G. A. Waring. The highest figures for groups 1, 2 and 3 respectively are 3.1, 4.99 and 2.21 parts of arsenic expressed as As_2O_3 per million parts of water.

CLINICAL HISTORIES

The circumstances connected with a sample of well water, sent to me by Dr. B. of Madoc, Ontario, on August 29, 1935, with a request to examine for the presence of arsenic, may be described.

**Presented at the Fifth Annual Christmas Meeting of the Laboratory Section, Canadian Public Health Association, Toronto, December, 1936, and abstracted in the Journal, 1937, 28:38.*

(a) In August, 1932, Thomas F., farmer, aged 29 years, consulted Dr. B., complaining of weakness and inability to walk. He had not felt well since an attack of influenza in February of that year. He showed bronzing of the skin, ascites, hyperkeratosis of the palms of the hands and soles of the feet. At first the urine was clear but later contained albumen. On August 30th the patient was examined in Kingston, Ontario, by Dr. T., who noted that the skin was pigmented with clear "bean-sized" areas. The blood pressure was

TABLE I
ARSENICAL CONTENT OF CERTAIN MINERAL SPRINGS

Mineral Spring	Analysis	Arsenic content in parts per million reckoned as the radical	
		AsO ₄	As ₂ O ₃
Group 1			
<i>Yellowstone National Park Hot Spring Waters</i>	Gooch and Whitfield		
Coral Spring, Norris Basin	U.S.G.S. Bulletin	1.4	0.8
Echinus Spring, Norris Basin	47, 1888	2.3	1.6
Old Faithful Geyser, Upper Basin		3.3	2.1
Excelsior Geyser, Midway Basin		3.9	2.6
Cleopatra Spring, Mammoth Springs		4.5	3.1
Group 2			
<i>Norris Basin Waters</i>	Allen and Day		
Fissure Geyser, Porcelain Basin	Publication 466,	0.1	0.07
Spring (unnamed), One-hundred-spring Plain	Carnegie Institution of Washington, 1935	0.3	0.21
Medusa Spring, South Section		0.9	0.64
Minute Geyser, South Section		2.7	1.92
Constant Geyser, Porcelain Basin		3.6	2.56
Spring (unnamed) Porcelain Basin		4.5	3.20
Cinder Pool, One-hundred-spring Plain		5.0	3.56
Group 3			
<i>California Hot and Cold Spring Waters</i>	Waring		
California Hot Springs (Tulare Co.)	U.S.G.S. Water	1.7	1.21
San Luis Hot Spring (San Luis Obispo Co.)	Supply Paper No. 338	3.1	2.21
Harbin Hot Springs (Lake Co.)		0.8-3.1	0.57-2.21
Shasta Springs (cold) (Siskiyou Co.)		1.4	1
Castle Crag Spring (Shasta Co.)		0.9	0.64

estimated at 190 mm. Hg (systolic) and 125 mm. Hg (diastolic). A large amount of albumen was found in the urine, abundant pus cells and granular casts being seen on microscopic examination of the centrifugized deposit. The diagnosis of advanced chronic nephritis was confirmed by Dr. F., who found evidence of albuminuric retinitis on ophthalmoscopic examination. A prognosis of 6 to 18 months was given but the patient died in coma on October 9, 1932.

(b) In the spring of 1935, Mrs. Thomas F., aged 36 years, her daughter Frances, aged 4 years, and her brother-in-law, Fred F., aged 25 years, began to show signs of pigmentation of the skin and hyperkeratosis of the palms of the hands and soles of the feet. On April 23rd, Mrs. Thomas F. was referred to

Dr. C. for consultation. The patient gave a history of having contracted a severe chill in February. She was put to bed in March in her father-in-law's home which is situated about half a mile farther north and on the opposite side of the concession road. After her recovery she felt much better but on returning to the farm she began to complain of weakness, loss of appetite and gastro-intestinal disturbance. At the time of the clinical examination, her radial pulse-rate was 54 per minute with double this rate at the apex of the heart, due to an extra-systole; the blood-pressure was 130 mm. Hg (systolic) and 70 mm. Hg (diastolic); the skin was quite pigmented and scaly; there was marked hyperkeratosis of palms and soles; the urine was clear and the haemoglobin 75 per cent. A diagnosis of arsenical poisoning was made. The patient was advised to rest for 3 months, and a general tonic excluding arsenic was prescribed.

(c) Of four children born alive to Mrs. Thomas F., one has survived and is now 4 years of age. The other three children died a few minutes after birth and were apparently healthy except for a duskiness of the skin. The circumstances relating to the births and deaths of the infants are given in table II.

TABLE II

Date of birth	Result	Accoucheur
August 15, 1928.....	Female infant; succumbed a few minutes after birth..	Dr. E.
August 15, 1929.....	Male infant; succumbed a few minutes after birth....	Dr. E.
May 25, 1931.....	Female infant; survived.....	Dr. L.
September 9, 1932...	Male infant; succumbed shortly after birth.....	Dr. L.

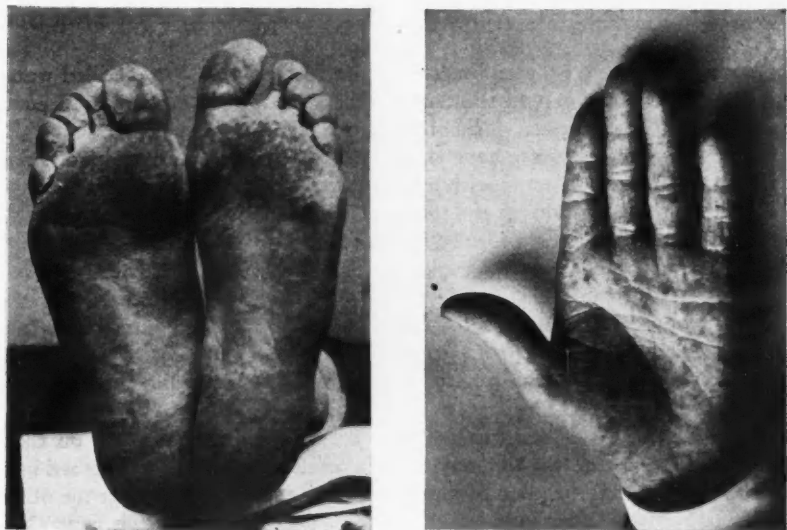
(d) After the death of his brother in October, 1932, Fred F. took over the farm. At the date of my first visit, September 27, 1935, he stated that he had never felt well since he began to work on this farm. He had suffered from nausea and vomiting and, on occasions, albumen had been detected in his urine by the local physician, Dr. B. During the months of March and April, 1935, he had consulted Dr. S., Belleville, Ontario, when x-ray plates were taken of his chest, stomach and gall-bladder, but no abnormal findings were discovered. Clinically, he was a pronounced case of arsenic poisoning: there was hyperkeratosis of the palms and soles and pigmentation of the skin around the neck and over the chest. He complained of dryness of the hair, numbness of the fingers and toes, swelling of the ankles, and nocturnal frequency of micturition. Since his operation in June he had improved in health and felt much stronger.

The occasion of his operation four months prior to my visit arose from the increasing severity of his gastro-intestinal symptoms. Appendicitis was suspected and he was removed to the Hôtel Dieu hospital in Kingston. According to the hospital record, he was admitted on June 3rd complaining of severe pain, nausea and vomiting. Nausea had been experienced during the past year and attacks of colic had become more frequent during the past 6 months, at times persisting for 5 to 10 minutes. His previous health and personal history were good. On admission the temperature was 98.4°F., the respiration rate 20 and the pulse rate 80 per minute. The white blood cell count was low,

amounting to 2,500 cells per cubic millimetre. A diagnosis of appendicitis was made and appendectomy performed on June 4th.

The pathological description based on gross appearances of the excised appendix was: "catarrhal appendix with obliteration of the tip, faecal accumulation in the lumen, pressure atrophy of the wall and fibrous adhesions in the mid-portion".

The patient was discharged from hospital on June 19th and went to his father's house to recuperate. He resumed work on his own farm at the beginning of July and after a few days began to experience a return of his former



FIGURES I and II. Photographs showing keratoses with warty excrescences on the soles of the feet and palms of the hands. (Left hand only exhibited.)

symptoms—nausea, vomiting and abdominal pain. His suspicions were aroused and he sent a sample of the well water for examination to the Branch Laboratory of the Ontario Department of Health at Peterborough. Later, a sample was sent to the Central Laboratory, Toronto, for chemical analysis. A report issued on July 31st indicated that the sample contained an amount of arsenic, expressed as arsenious oxide equivalent to 7/10 grain per imperial gallon.

The photographs (figures I and II) of the soles of the feet and the left hand of Fred F. show a generalized thickening of the skin with warty excrescences. The keratosed skin over the terminal phalanges of the fingers has obliterated the normal markings.

INVESTIGATION

On September 27, 1935, I visited Mr. Fred F.'s farm and made an inspection of the incriminated well. This was stated to be a drilled well 94 feet deep

into the rock. The pump was of modern design and enclosed in a wooden shed along with a gasoline motor used for pumping supplies for the stock animals. Apparently any effect on the animals had not been sufficient to excite suspicion of the well water, although the farmer had felt that the yield of milk from the cows had not been as plentiful as it ought to have been and besides several pigs had died from an unascertained cause.

In searching for an outcropping of the stratum through which the well was drilled, I came across a few pieces of limestone, closely resembling sandstone, which had been recently unearthed by the farmer when erecting a new wooden fence around the piggery. The piggery was situated about 20 feet from the shaft of the well, and a limestone stratum had been encountered 2 feet from the surface.

A sample of the powdered limestone, previously washed in distilled water and dried, was subjected to the Gutzeit test and found to contain 15 parts arsenic as As_2O_3 per million parts of limestone or 1.05 grains per lb.

Preliminary experiments have shown that the limestone consists of small grains of calcite and dolomite with a little silica and iron. It appears that the iron is in the *ferrous* condition and the arsenic in the *arsenate* form, for a sample of the powdered limestone dissolved in dilute HCl gives an iodide test of much greater intensity than control experiments with sodium arsenite, arsenious oxide and HCl alone. The iodide test for an arsenate is valid only in the absence of appreciable quantities of ferric iron. It may be assumed therefore that the arsenic occurs as ferrous arsenate— $\text{Fe}_3(\text{AsO}_4)_2 \cdot 6\text{H}_2\text{O}$.

Three possibilities accounting for the origin of the arsenic in the limestone may be considered.

1. Farmers are known to use calcium arsenate as an insecticide on their potato plants and thus the soil may contain arsenic which may be washed into the underlying stratum, aided by the percolating action of rain. On the other hand, the farmer denied using any arsenical preparation for the control of insect pests on this farm. And further, since the chemical analysis shows that the arsenic is not linked with calcium or magnesium but with iron in the ferrous condition we may discard this possibility.

2. It is conceivable that arsenic may have been derived from the urine of pigs in the piggery, percolating through the soil into the porous limestone rock, a sample of which had been recently dug up by the farmer. There seems evidence, however, from the work of D. Vitali (6) to prove that arsenates are excreted as arsenites and since the arsenic occurs in the well water in the arsenate form, this theory must be rejected. According to D. Vitali's experiments on dogs, arsenic anhydride (As_2O_5) is converted by the organism into arsenic trioxide (As_2O_3) which then passes into the urine; the arsenic acid is not found free in the urine but rather in a state of combination probably displacing phosphoric acid in phosphoglyceric acid.

3. Of all the forms in which arsenic occurs in the native state, arsenopyrite is the commonest. According to Dana (7), one of the chief localities for arsenopyrite is cited as occurring in large beds in veins at Deloro, which lies approximately 10 miles west of Madoc. It may be that the occurrence of the ferrous arsenate in the limestone is due to the weathering of arsenopyrite

(FeAsS) at some distant point, salts of arsenic being formed; these salts, finding their way into streams, have been carried along with carbonates of lime and magnesium and deposited as a local stratum.

Chemical Tests

Samples of the well water have been examined chemically for the presence of arsenic at intervals since the first sample was received in my laboratory on August 29, 1935. This sample contained 1/5 grain of arsenic as As_2O_3 per gallon as compared with the sample taken on July 22, 1935, which was found to contain 7/10 grain of arsenic per gallon at the Laboratories of the Ontario Department of Health. However, a portion of a sample which had been taken on August 7, 1935, and retained for future reference was obtained and found to contain 7/10 grain arsenic per gallon. Table III shows the variation in the arsenic content of the well water in samples taken during 1935. In this connection it is to be noted that from August 1, 1935, no water from the well was pumped for household purposes and very soon afterwards a dug well 12 feet deep was used to supply water for the stock animals.

TABLE III
VARIATION IN THE ARSENIC CONTENT OF THE WELL WATER

Number of Sample	Date when taken 1935	Arsenic as As_2O_3 expressed in		Laboratory
		parts per million	grains per gallon	
1	July 22.....	10	0.7	Dept. of Health
2	Aug. 7.....	9.6	0.67	Preventive Medicine
3	Aug. 29.....	3	0.2	Preventive Medicine
4	Sept. 12.....	1.5	0.1	Dept. of Health
5	(Sept. 27.....	1.4	0.1	Preventive Medicine
	Sept. 27.....	1.4	0.1	Dept. of Health
6	Oct. 23.....	0.5	0.035	Preventive Medicine
7	Dec. 11.....	0.4	0.028	Preventive Medicine

Since the water samples were bright, clear and sparkling and contained no visible suspended matter, it was at first presumed that the arsenic was dissolved in the water, but filtration experiments soon convinced me that the arsenic must be present in very fine particles in suspension. Different samples of the water were filtered through Seitz EK filter discs and the filtrates tested for the presence of arsenic. All yielded negative Gutzeit reactions, while the unfiltered samples in 25 cc. amounts and the individual filter discs gave positive results. This led to the microscopic examination of the filter discs in repeat experiments when particles of varying size, shape, and depth of brownish colour were observed by reflected light. It was concluded that these brownish particles were ferrous arsenate particles derived from the limestone stratum through which the well had been drilled and chemical tests have confirmed this opinion.

Since samples of the limestone rock subjected to the Gutzeit test have yielded as high as 15 parts arsenic expressed as As_2O_3 per million parts of powdered rock, thin sections were made through the courtesy of Dr. E. L.

Bruce, Geology Department. Microscopic examination of the sections reveals the presence of brownish particles, some lying between the calcite and dolomite grains, others of larger size apparently superficial to the crystals and shading out over them as shown in the microphotograph (figure III). In other areas, a streak or stain composed of irregular aggregations of brownish particles is seen.

Similar sections of the scale from the kitchen kettle have been made and examined microscopically. As shown in the microphotograph (figure IV), there are dense aggregations of dark brown particles of varying size and shape, as well as smaller particles disseminated throughout the matrix of amorphous lime salts. A powdered sample of the scale yielded 4000 parts arsenic as As_2O_3 per million parts of scale, equivalent to 0.4 per cent. arsenic.

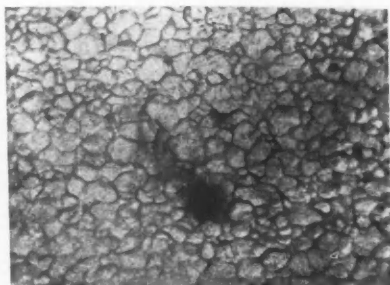


FIGURE III

FIGURE III. Microphotograph of section of limestone showing a brownish aggregation of ferrous arsenate particles, shading out over the crystalline calcite and dolomite grains. (Magnification 90 times.)

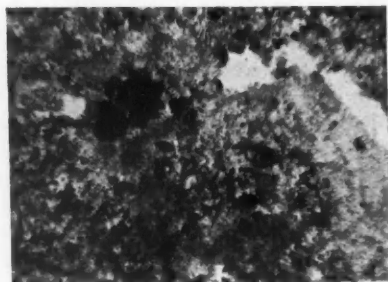


FIGURE IV

FIGURE IV. Microphotograph of section of kettle scale showing irregular dark brown aggregations of ferrous arsenate particles, some of which are sharply outlined. Lighter greyish-brown material of the same nature is disseminated irregularly throughout the matrix of amorphous lime salts. (Magnification 220 times.)

Questions have naturally arisen since the investigation commenced in August, 1935, as to (1) the condition of the well waters of neighbouring farms, (2) the date when the incriminated well was drilled, and (3) the state of health of the farmer who sold the farm in 1927 to Thomas F.

Table IV shows the results of tests for the presence of arsenic in neighbouring wells. These gave negative findings, and it is noteworthy that the incriminated well is of much greater depth than the others. It is suggested, therefore, that the limestone stratum is a localized deposit and that the content of ferrous arsenate may increase with increasing depth of the stratum.

In November, 1936, an opportunity was afforded me of meeting the former owner of the farm, A. H., aged 66 years, who told me that the well was drilled in 1922 through "red rock" (limestone) and that subsequently he had not felt well. Being unable either to secure satisfactory farm labour or to manage the farm alone, he sold it under terms of a mortgage. A. H. admitted he had not been well for about 12 years and was being treated by his physician for anaemia. I suspected he was suffering from chronic arsenical poisoning and on examining his hands found distinct hyperkeratosis of the hypotherar eminences which he attributed to hard work.

TABLE IV

RESULTS OF TESTS FOR THE PRESENCE OF ARSENIC IN FARM WELL WATERS WITHIN A RADIUS OF HALF-MILE FROM THE INCRIMINATED WELL

Owner of Farm Well	Type of Well	Arsenic as As_2O_3	
		parts per million	grains per gallon
Fred F.	Drilled; 94 ft. deep.	1.5	0.1
Fred F.	Dug; 12 ft. deep; no cover; loose stone.	<0.003	<0.0002
W. J. W.	Dug; 40 ft. deep; wooden cover.	<0.003	<0.0002
H. O'C.	Dug; 15 ft. deep; wooden cover; loose stone.		
F. F. F.	Drilled; 42 ft. deep; situated under house.		

Tests made at end of September, 1935, by Sanitary Engineering Division, Ontario Department of Health.

DISCUSSION

The clinical histories of the adults, A. H., Mrs. Thomas F., and Fred F., indicate that a period of approximately $2\frac{1}{2}$ years was sufficient to produce symptoms of chronic arsenical poisoning from the use of the well water. Two years after the well was drilled A. H. began to feel unwell. Mrs. Thomas F. did not show signs coincidently with her husband, who died presumably from arsenical nephritis. But during her married life of 5 years she had 4 pregnancies and any arsenic ingested would tend to be stored in the foetal tissues. Two and a half years after her husband's death, however, she began to complain of weakness and this led to a diagnosis of arsenical keratosis of palms and soles. At the same time her brother-in-law, Fred F., complained of gastrointestinal distress which eventually led to his operation. The low white blood cell count indicated some toxic factor in his illness and the pathological condition of the excised appendix was insufficient to account for the attacks of abdominal pain, although it might have given rise later on to perforation.

Cases of chronic arsenical poisoning have been met with in industrial processes where arsenic is used and also as a result of the medicinal administration of the drug. Professor R. Stockman (8) considers that serious chronic arsenical poisoning from the latter cause is decidedly rare. The occurrence of cases of this type from the use of a well water contaminated naturally with arsenic is, so far as I have been able to ascertain, unique.

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The Adrenal Glands: A Review of Laboratory and Clinical Studies*

R. A. CLEGHORN, M.D., D.Sc.

Department of Medicine, University of Toronto

PART II: The Adrenal Cortex†

THE effects of removal of the adrenal cortex are as drastic as the results of epinephrine injection are dramatic. The animal dies. While there are instances in which death does not follow adrenalectomy, these have been generally considered as due to incomplete removal of the tissue, and therefore the conclusion that the glands are essential to life has been widely accepted. Recent reports, however, indicate that under certain circumstances the glands may be entirely dispensed with, at least in one species—the dog. This appears at first sight to threaten the validity of the above conclusion but, in reality, only modifies it, as will be shown later.

THE CONSEQUENCES OF ADRENALECTOMY

The duration of survival after adrenalectomy is variable, and the factors influencing it manifold. Of these: (i) surgical skill and aseptic technique are of paramount importance and the plethora of reports which cite a few hours as the survival period of animals after removal of their adrenals is not an indication of how long life can be sustained without the internal secretion of this gland but an index of the amount of shock the subject endured. Under the heading "surgical skill" one must include diminution of period of anaesthesia to a minimum, avoidance of haemorrhage, and in pre- and post-operative periods extremes of temperature. The effects of the operation and the loss of the hormone function of the extirpated glands were first clearly distinguished by Biedl, 1913, by Elliott, 1914, and by Stewart and Rogoff, 1924-28, to whose technical competence and care we are indebted for a true estimation of the life span of animals after adrenalectomy. This in cats and dogs is about ten days. Guinea pigs do not survive as long but (ii) a species difference exists for rats, mice and rabbits which frequently show a prolonged post-operative life, many living some weeks, and a few apparently a normal life span, though the majority die within two weeks. (iii) Incomplete excision of the glandular tissue at operation, either as a result of faulty technique or (iv) due to the occurrence of accessory tissue at a site remote enough from the gland to escape removal at operation accounts for the occasional survival of animals belonging to the species in which the operation is generally fatal. While in dogs and cats ectopic tissue is a rare occurrence, this is a most important cause for the survival of

*The first of a series of reviews of laboratory and clinical studies of hormones.

†Part I, *The Adrenal Medulla*, was published in the February issue (page 88).

rodents in which new adrenal tissue also appears in the form of cell rests stimulated to growth by adrenalectomy. In all instances it is cortical tissue only which is important for the survival of the animal. Singularly enough it is in rodents that cortical tissue grafts take most easily. Successful grafting has not been demonstrated in the dog or cat. (v) Age is a factor, for immature animals with their higher metabolism do not survive as long as adults. (vi) The state of the reproductive tract is also of considerable importance for it has been shown that dogs operated on during heat or pregnancy live long periods (Stewart and Rogoff). (vii) Finally, frequent intravenous injections of saline extend survival (Banting and Gairns, 1926; Stewart and Rogoff, 1927). That this is due to the specific effect of the sodium ion was suggested in 1927 by Marine and Baumann who found isotonic sodium acetate equally effective.

The cortex is the vital tissue, as indicated above, and not the medulla. This fact was verified by experiments in which the medulla of the gland was scooped out, leaving a shell of cortical tissue. The animals lived, but when the cortical tissue also was removed death followed (Wheeler and Vincent, 1917; Houssay and Lewis, 1923). Criticism of such experiments on the grounds of the extreme difficulty in totally removing one part of a complex gland has been met by confirmation of the result on a subject apparently designed by nature to be free from this objection. The subject was a Selachian-fish in which the two tissues occur separately. Here excision of the cortical, or interrenal tissue as it is called, could be done without any question of damage to the medulla. The fish died (Biedl, 1913; Kisch, 1928).

Final and complete evidence that it is failure of cortical and not of medullary function that leads to the death of adrenalectomized animals came with substitution therapy, by which it was shown that epinephrine-free extracts of adrenal glands will sustain life and, like the other hormones, the source of the extract may be from a species other than that into which it is injected.

The symptoms following total adrenalectomy are essentially similar in all animals, though one must exclude those dying within 24 to 48 hours of the operation as largely due to shock. Following careful, complete and expeditious removal of the second gland from a healthy animal, in which the retroperitoneal lumbar approach is used, recovery is quick and no change of behaviour is noticed for several days. Animals which have been kept alive by adrenal cortical extracts show a slightly longer survival after cessation of extract injections than those in which an operation marks the termination of the influence of the cortical hormone on the body, and though the onset of symptoms is delayed a few days they are the same as in the freshly operated animals when they appear. A slight decline in weight may be apparent before the first symptom—impaired appetite—appears. This develops in the course of three or four days to a complete anorexia and is early directed toward fat. Apathy becomes apparent within 24 to 48 hours of refusal of food. Diarrhoea and vomiting occur occasionally. A day or two before death, weakness in the hind legs becomes apparent and in cats the body temperature falls. This is not so pronounced a feature in dogs, though the extremities are noticeably cold in both species at this time. Muscular weakness becomes more pronounced as the end approaches, and the heart rate becomes slower. Finally, the animal is unable to stand and

within two or three hours coma, muscular twitchings and convulsions ensue and death supervenes, the heart stopping in diastole after the respiration has failed. In animals such as rats and rabbits living longer periods of time, hair loss is an additional symptom.

The post mortem findings are extraordinarily few. Hyperaemic congestion of the visceral organs: liver, spleen, pancreas, kidneys, stomach and intestines, is usually marked. Haemorrhage of the gastric and intestinal mucosa is also frequently found. Ulcers of various shape and size occur quite regularly in the stomach and duodenum near the pylorus. Enlargement of the lymph glands and thymus are often encountered. Nephrosis of both liver and kidney parenchyma has been described. The weight loss of the animal by the time of death may be as much as 20 per cent. These changes have contributed little to our understanding of the fundamental functional upset in the organism that leads to death, though they are partly understandable now from knowledge obtained by other means of investigation.

The susceptibility to toxins and infections of adrenalectomized animals and, indeed, of patients with Addison's disease has long been known. Injections of diphtheria toxin, histamine, morphine, and other noxious substances produce death in experimental animals in fractions of the minimal lethal dose necessary for normals of the species. Infections which in normal individuals produce little untoward effect exaggerate markedly the signs of adrenal insufficiency and often lead to an early death. There is no proof that an actual change in susceptibility to infection exists or a change in antibodies, but merely in the reaction to the injurious agent.

The blood chemistry shows marked changes with the onset of the symptoms of adrenal insufficiency. These are reasonably similar in most species. The first to appear is an increase in the non-protein nitrogen which may be observed even before diminution in the appetite. Urea is largely contributory to this rise but other nitrogenous constituents, such as creatinine and uric acid, are also increased. Contemporaneously with this change, concentration of the blood occurs, as evidenced by an increase in the erythrocyte count and diminution of plasma volume, which result largely from an increased water loss by way of the kidneys. This loss of water is accompanied by an increased excretion of sodium and chloride ions and in the blood this is evidenced as diminution in the serum content of these constituents and in a loss of alkaline reserve. The fall of blood sodium may be as much as 20 per cent. from its normal value, though chloride loss is less. In contrast to this is the behaviour of the other ions which increase with the progress of insufficiency paralleling the haemoconcentration. In this class fall magnesium, calcium, inorganic phosphates and sulphates. Serum potassium increases too but apparently in excess of the effect of the concentrated plasma volume. An exception to the fall in serum sodium is given by Britton, who observed a rise of this element in the opossum. In some species, *e.g.* the cat and marmot, the blood sugar falls markedly towards the end. This is rarely seen in the dog.

Carbohydrate metabolism is profoundly disturbed after adrenalectomy in some species, as the fall in blood sugar would indicate. Britton and Silvette and others have studied the carbohydrate changes in species in which this is a

marked effect of adrenalectomy. The outstanding changes observed are: depletion of the glycogen stores of the liver, impaired glycogen deposition after injection of glucose and d-lactic acid, and impaired gluconeogenesis (Macleod; Long and Lukens). Britton, 1934, also reports that the usual degree of hyperglycaemia following injections of epinephrine are not observed in adrenalectomized animals.

EXTRACTS OF THE ADRENAL CORTEX

Ten years ago the results of extirpation of the adrenals indicated that this organ, having the structure of a gland of internal secretion, actually contributed a hormone to the body that was necessary for life and that it was the cortex of the gland which played the important part in this process.

The preparation of extracts of adrenal cortex which could replace the function of the missing gland was first reported in 1927. In that year two groups of workers, first Stewart and Rogoff and, shortly after, Hartman, McArthur and Hartman, published accounts of the slight extension of the life of adrenalectomized animals by the injection of extracts of cortical tissue. Though these results were not striking they were a portent. By 1930 Hartman and his colleagues were able to report considerable progress: a purified extract, almost epinephrine-free, which prolonged the lives of adrenalectomized cats apparently indefinitely, and revived animals prostrate from insufficiency. A third group of experimenters, Swingle and Pfiffner of Princeton, entered the field about this time, using organic solvents for the fractionation of an alcoholic extract of beef glands. This method yielded an active extract, the effects of which they and others have vigorously investigated. Though other workers have evolved methods for the preparation of active extracts of the adrenal cortex, that of Swingle and Pfiffner has remained the most satisfactory until recently at least. The chief objections to it are the complexity of the method and the occasional toxic effects reported following its use.

The potency of cortical extracts could be estimated by only one method when they were first introduced, namely by the extension of the post-adrenalectomy life-period of the test animals beyond that of an adequate number of untreated controls. This was an exacting criterion but one for which no good substitute has been found, though certain modifications have improved the quantitative determination of an extract's strength on which at first qualitative determinations of activity only could be made.

Many workers have endeavoured to make use of the adrenalectomized rat for assay of extracts. This animal, on account of its size, offers many advantages in convenience and economy, but since so many of this species live considerable periods after operation and exhibit growth the life span and restoration of growth cannot serve as reliable indices of the strength of an extract. This criticism is valid for mice and rabbits likewise.

Cats, while not open to these objections, are in many ways undesirable objects for assay work, being particularly difficult animals from which to draw blood for chemical estimations.

The dog has been found to be most suitable of all animals for the estimations of the potency of extracts and quantitative work can be done with an

accuracy of ± 25 per cent. by the technique devised by Harrop, Weinstein, Swingle and Pfiffner in 1932. This method defines a unit of extract as the minimal amount per kilogram body weight which, administered twice daily, is just sufficient to prevent a substantial rise in the blood non-protein nitrogen or urea. In the actual conduct of the assay, an approximation to the necessary dose is made and every week or ten days the amount administered is cut in half until a rise of 100 per cent. in the blood non-protein nitrogen or urea occurs.

The chemistry of the adrenal cortical hormone is occupying the attention of many workers at the present time and Wintersteiner and Pfiffner, Kendall, and Reichstein appear to have made considerable progress in this field. The last named author has recently announced the isolation of the active substance (*Nature*, Jan. 2, 1937) and the nature and chemical composition of the substance will probably be reported in the near future.

It is clearly established that vitamin C (ascorbic or cevitamic acid) isolated from the adrenal cortex by Szent-Györgyi a number of years ago is not a hormone of the gland, though the significance of its presence here and in other endocrine organs is entirely unknown.

Injection of adrenal cortical extracts has no definite known effect on the normal animal, though there is some evidence that administration of large amounts may increase the capacity of animals for work on the treadmill and cause a retention of sodium-chloride and an excretion of potassium. Certainly there is no marked effect on blood chemistry of the normal. In the adrenalectomized animal suffering from either mild or severe insufficiency strength and appetite are restored, as are the aberrant blood findings and carbohydrate stores. In the animal prostrate from adrenal insufficiency, this effect is most dramatic and an animal incapable of moving and obviously on the point of death may, within an hour of injection, be walking about. The amount of extract necessary to revive such an animal and to restore it once more to health is many times that necessary to maintain it in good condition.

It is pertinent here to add a word concerning the mode of administration of the hormone. In animals it is only one-twelfth as active by mouth as when administered subcutaneously. In patients with Addison's disease, intramuscular injection is preferable to subcutaneous injection, though reliable non-toxic preparations can be given intravenously in crises.

THE FUNCTION OF THE ADRENAL CORTICAL HORMONE

This is not known at the present time, but the suspicion that a breakdown in protein metabolism and the consequent accumulation of nitrogenous waste product cause death seems obviously untenable from the fact that there is no constancy in the non-protein nitrogen at death and that ligation of the ureters results in much higher values than ever found in adrenal insufficiency before death supervenes. Substantial supporting evidence for the well-nigh groundless assignment to the cortex of a role in lipid metabolism has not appeared during the past few years' intensive study. Recently, however, three theories have been advanced which require consideration here.

Hartman and his colleagues suggested in 1932 that the cortex produces a general tissue hormone which accounts for the evidence of breakdown in so

many physiological mechanisms after adrenalectomy, *e.g.*: circulatory and digestive systems; carbohydrate metabolism; temperature regulation. The virtue in this hypothesis is the difficulty in proving it wrong. Exponents of other more definite theories bear the heavy burden of proof of their own contentions.

Britton and Silvette have vigorously advocated since 1932 the primacy of adrenal cortex function as control of carbohydrate metabolism. They have presented conclusive evidence of diminution of glycogen stores and failure in carbohydrate mobilization in certain species in adrenal insufficiency and, though their work has received supporting evidence from independent observers, just how fundamental are the changes is difficult to assess.

The third theory expounded in terse statements by Swingle and his colleagues (Science, 1933) pointed out the parallelism between adrenal insufficiency and surgical shock and indicated as their belief that the regulation of the circulating volume of fluid was the essential function of the cortex. They report that the blood urea rises within 24 to 72 hours of discontinuing extract in dogs and simultaneously the serum volume and blood pressure fall. The decreased kidney function in respect to nitrogen they feel is due to reduced filtration pressure, and they remark that, in spite of the relative increase of blood colloids, fluid pours out by the kidney. In subsequent papers they demonstrated the ability of extract to revive prostrated dogs without the aid of extra fluid and conclude that the animal in such circumstances is enabled to mobilize salt and fluid from its own tissues to restore the blood volume to normal.

The view of Loeb and of Harrop is substantially a modification of the above. The haemoconcentration which takes place in the dog after removal of the influence of the cortical hormone, these workers indicate, is due to the loss of sodium and chloride and their complement of water by way of the kidney. They state, therefore, that the available evidence points to the kidney as the site of action of the hormone which, by its action there, controls sodium chloride and potassium excretion and consequently the balance and distribution of water in the body. Support for this view is found in the recent work of Harrop and of Allers (1935), who have claimed to be successful in prolonging the life of adrenalectomized dogs not receiving extract for many months by feeding diets high in sodium. This is the circumstance referred to at the beginning of this section, which modifies the general statement that the cortex is essential to life.

Evidence on the mechanism of the functional defect in the kidney in adrenal insufficiency has recently been presented by Jiminez-Diaz. In a brilliant paper he has drawn attention to the failure of the kidney to form ammonia in the absence of the cortical hormone and pointed out how this deficiency results in the excretion of the basic ion sodium as a compensating mechanism. He is careful to mention that the kidney is not the only malfunctioning tissue under these circumstances and advances facts and arguments whose recognition should lead to more clarifying work in the near future.

RELATION OF ADRENAL CORTEX TO OTHER ENDOCRINE GLANDS

The pituitary controls the growth of the adrenal cortex, for it has been proved repeatedly that atrophy of this tissue occurs following hypophysectomy.

Conversely, injection of anterior pituitary extracts produces growth of the atrophied cortex in hypophysectomized animals. The pituitary extracts have been fractionated by Collip and others so that a relatively pure portion having action on the adrenal cortex alone has been obtained. This has been called the adrenotropic hormone of the anterior pituitary lobe.

The gonads are related in some obscure way to the adrenal cortex as illustrated by the occurrence of amenorrhoea and masculinization of females in whom adrenal cortical tumours occur. Broster and others have shown that a restitution of normal feminine characteristics occurs when the tumour is removed. There is no clear experimental evidence casting light on the mechanism of these changes.

ADDISON'S DISEASE

This evidence of adrenal insufficiency in man has responded to the methods employed in the treatment of adrenalectomized animals, namely: salt and cortical extracts. Since, however, the onset of the insufficiency is insidious and the course of the disease chronic, it is not an exact parallel of the experimental state obtaining in animals after removal of the adrenal tissue.

Pigmentation, which is not found in experimental animals, is little influenced by even modern methods of treatment. It seems that this symptom is associated with the destruction of the adrenal medulla, and in Part I of this article reference is made to the possible mechanism of this excess pigment production. The other features of the clinical trial, namely, asthenia and low blood pressure, most important to the life of the patient, are definitely signs of deficiency of the adrenal cortex and respond to salt and extract therapy.

In the treatment of the disease the chronic case whose chief complaint is easily-induced fatigue and weakness is benefited greatly by taking amounts of salt considerably in excess of that normally employed in seasoning food. Eight grams of sodium chloride and four grams of sodium citrate taken in fifteen-grain (one-gram) capsules with meals is a not unusual dose, though each case must be treated individually and the amount adjusted to suit the case. Excess ingestion of salt may be manifested by diarrhoea, vomiting or oedema. Nausea and vomiting must, however, be regarded with concern as they are often the premonitory signs of crisis.

These crises which mark the course of the disease more or less frequently resemble acute experimental adrenal insufficiency in respect to the profound prostration, serious drop in blood pressure, and changes which occur in the blood chemistry. Intravenous 2.5 per cent. saline with glucose, run in slowly after the first 500 cc. and never totalling more than 2,000 cc. in twelve hours, is a most effective immediate remedy. Cortical extract given intravenously or intramuscularly is a most valuable adjunct, particularly when the situation is most grave.

Some few cases even during remissions require extract given intramuscularly several times a week, as well as extra salt in their diet, to enable them to undertake even the most moderate activity. And, as in adrenalectomized animals, so in man with Addison's disease, fatigue, exposure to extremes of temperature and infection must be avoided if life is to be prolonged.

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A SOUND ATTITUDE AND A NEW APPROACH TO THE PROBLEM OF MENTAL DEFECT

SO frequently we use the word "normal", yet so rarely do we know precisely what is understood by it. Those who have become acquainted with the attributes and significance of the so-called "normal curve" more fully appreciate the true meaning and limited application of the word "normal". All attributes known to man are subject to variation and it is no novel phenomenon that variations in intelligence also occur. There are upper, middle, and lower strata of intelligence, the majority of persons in a state or country falling into the middle group. In respect to social behaviour and ability to adapt or adjust in a given environment members of any one of the strata may fail. People usually regard the mental defective, those in the lower stratum, as being a particular source of social concern in this respect and through many years of increasing interest in this group of persons, enthusiasts have come to regard with alarm the apparent increase in the extent of this problem. This increase is, however, only apparent.

In an article in this issue, Dr. B. T. McGhie indicates that there is no sound evidence in support of a real increase in the number of mental defectives in the community. Factors which have contributed to a recorded increase in the number of mentally subnormal *known* to live in a community are increasing accuracy of diagnosis, increasing vigilance of those interested in finding such cases, and perhaps more than anything else a change in the social attitude toward institutions for the care and education of those persons, as well as an increase in the facilities actually available for their accommodation.

Dr. McGhie dispels the alarmists' attitude in respect to mental defect by citing the lack of valid evidence in support of their case. The careful scientific investigation into this whole problem made by the Committee of the American Neurological Association offers no support for the contention that mental defect is increasing. A review of this work under the title "Eugenic Sterilization" appears in the department of Books and Reports in this issue. The authors of this report further state that "the reported high fertility of the mental defective

group is a myth, based on the assumption that those who are low in the cultural scale are also mentally and biologically defective."

In the article by Dr. McGhie, proposed solutions to the problem presented by the subnormal are dealt with—registration, segregation, and sterilization in turn being shown to be of limited value. The author further points out that while 2,000 mental defectives are to be found in Ontario institutions, and 5,000 others have been identified in the community, there must be at least 55,000 others who are able to carry on in the community without being recognized by authorities or social agencies. Since this is so, it becomes evident that the one really promising plan of approach to this problem of the subnormal is "special education and community supervision." Since 90 per cent. of the subnormal are able to get along satisfactorily in the complex environment of to-day, the task at hand is to teach all members of this group how to live in a socially acceptable manner. Through the provincial mental health clinics, the feasibility of community training and supervision for mental defectives has been demonstrated. Real success has been achieved in this respect through the work of clinics and this approach to the problem offers a more modern attitude and a more scientific solution to this community problem.

MEDICAL EXAMINATION OF FOOD HANDLERS

THE report of laboratory examinations of routine specimens from food handlers made by Dr. James R. Scott, which is published in this issue, again raises the question of the status of the medical examination of food handlers. There is a general questioning by medical health officers of the value of the present system of requiring food handlers to furnish a certificate of health. The obvious defects are the cursory type of medical examination, the lack of interest on the part of the employer, and the feeling on the part of the employee that it is an unnecessary requirement. That the situation can be changed is shown by the experience of several cities where, in addition to a reasonably adequate medical examination which the employees now appreciate, instruction is given by the department of health to groups of food handlers, thus arousing an intelligent interest. The number of persons thus receiving the benefit of an examination and instruction in relation to their daily duties may be large; in one city with a population of a million and a half, for example, more than sixty thousand persons are included in the group of food handlers.

It is only when the health department and the physicians work together to make possible a reasonably adequate health examination and create an understanding on the part of those who are required to obtain health certificates that this requirement can be considered worth while. The requirement offers great possibilities in health education. The medical examination of food handlers may therefore be made a real force in health education as well as a public health safeguard.

CURRENT PUBLIC HEALTH COMMENT

THE THIRTEENTH ANNUAL REPORT OF THE BRITISH EMPIRE CANCER CAMPAIGN

THE thirteenth annual report of the British Empire Cancer Campaign was presented in the House of Lords in November of last year. This report is of great interest to us and while it is perhaps unfair to stress certain sections of it more than others, this is the result merely of the fact that we have been attracted by those sections because of our own specialized interest.

A tremendous volume of work continues to be carried out and these efforts, while not dramatic in respect to results, undoubtedly serve continually to clear more of the brush and to prepare the ground for the ultimate goal we are seeking—etiology.

Dr. J. P. Lockhart-Mummery, in his preface to this report, reviews the various experimental data reported upon this year. Work is presented which indicates that a filterable cell-free agent can be extracted from a mouse sarcoma, "which agent, after injection into other mice, produces a tumour transmissible by grafts." This suggests that a particulate cell-free agent may also be present in mammalian tumours (as in fowl tumours).

In studies made of certain conditions generally assumed to precede cancer of the cervix, by the Cancer Research Committee of the Marie Curie Hospital, it was found that cervical lacerations and chronic cervicitis were seldom a factor. In 115 of a group of stage 1 and stage 2 cases, the patient had never been pregnant. This is interesting in view of the stress usually laid on the above-mentioned factors as precancerous conditions. The fact remains, however, that the specific mortality among married women between 45 and 55 years of age from cancer of the uterus is about twice that in single women. It is suggested that endocrine dysfunction, rather than simple traumatism, may be the important factor.

In studies made of the mode of entry and spread of cancer cells in the lymphatics it has been shown that "in malignant disease of any internal organ, extension to lymphatic glands occurs generally by means of lymphatic emboli of cancer cells . . . and there is little evidence of continuous lymphatic permeation by malignant cells." This is a point of considerable practical importance from the clinical and therapeutic viewpoint, and it is suggested in the report covering this work that "more emphasis is to be placed on the dangers of excessive palpation of malignant tumours, as such may hasten metastases."

A knowledge of the phenomena of differential geographic mortality has, in many instances in the past, served well those searching for etiologic factors and those interested broadly in measures for the prevention and control of specific diseases. Attention has previously been drawn to the geographical variations which exist in England in respect to cancer deaths by Greenwood, Stocks and Karn. This report contains a further contribution of excellent merit by Percy Stocks, M.D., Medical Statistical Officer at the General Register Office, and is based on the recorded cancer deaths from 1921 to 1930.

Dr. Stocks has standardized for several organs the cancer mortality rates by counties for age, sex, and degree of urbanization. This final result is but a late step in a great volume of descriptive effort included in the laborious task of tabulating the 522,251 cancer deaths upon which this study is based. The digestive organs, skin, lung, and breast are covered by this report and are illustrated by a series of maps. Other organs will be dealt with subsequently. The striking differential mortality in cancer of the stomach, oesophagus and lung are particularly noteworthy.

In no country in the world has such practical use been made of cancer

statistics as in England and Wales, and in no country are these data more reliable. It is therefore extremely important that this problem be pursued further in other countries in so far as the available data will reasonably permit. The methods adopted in this study are fully illustrated in the appendix. It is desirable that the necessary funds may be made available for a similar detailed analysis of Canadian data. While the limitations of such studies as this on account of de facto death registration are significant, the new practice of the Dominion Bureau of Statistics in tabulating deaths according to usual place of residence as well as by place of occurrence will solve this difficulty.—*A. Hardisty Sellers, B.A., M.D., D.P.H.*

AN ACHIEVEMENT IN MATERNAL WELFARE BY LOCAL EFFORT

IN the last issue of the JOURNAL, we presented in the Editorial Section a plea for satisfactory evidence as to the nature and extent of the risk to life and health of mothers in pregnancy and childbearing—data which would offer direction and serve as a sound basis for a constructive program of maternal welfare.

There has just come to our notice the clinical report of the Willesden Maternity Hospital, in which Dr. Walker, the consulting obstetrician to the Willesden Borough Council, gives a statistical review of 3,000 consecutive deliveries. The background of this data is interesting and is provided by a memorandum which accompanied this report in its presentation to the Health Committee of the Willesden Borough Council on November 17, 1936. The experience of this municipality in respect to maternal mortality has been rather favourable in comparison with that of England and Wales as a whole. In 1935 the death rate for the Borough was lower by 30 per cent. than for the whole country.

In February, 1931, the Willesden Committee converted their smallpox hospital at Kingsbury into a mater-

nity hospital. In February, 1935, the hospital facilities were extended so as to be able to handle 1,000 cases per year. With the opening of this maternity hospital in 1931, a plan of arrangements for mothers entering the hospital was provided. Antenatal care was made available at Health Centres under the supervision of the Council's consultant obstetrician. Health visiting in connection with this care is fully carried out and "the failure or negligence on the part of the patient," referred to in the English and New York reports on maternal mortality, is thereby reduced to a minimum. Within the limits of the hospital accommodation, confinements are conducted in hospital under the supervision of the consultant obstetrician. Furthermore, post-natal care is provided at the Health Centres, also under supervision. All the conditions outlined in the English Departmental Reports as desirable are embodied in the Willesden scheme.

Dr. Walker's report of the first 3,000 cases admitted to the hospital under this scheme is of great interest, not only because it provides a wealth of experience on a broad basis, but also because it shows that of the 3,000 cases, 2,939 were "booked" and had the full benefit of the Council's arrangements. Of these "booked" cases, 3 died, giving a maternal death rate of one per 1,000 cases. Of the 61 women admitted as emergency cases, 4 died, a rate of 65.6 per 1,000. Since "booked" cases "tend to be weighted with those likely to require hospital care for medical reasons", this achievement in reducing mortality would appear to be a real and a substantial one. If the emergency cases are included with the mothers confined elsewhere, then 48 deaths occurred among 11,274 cases, or a rate of 4.3 per 1,000—a striking comparison.

This experience illustrates what can be accomplished by local effort in reducing deaths among mothers and an extension of the present principles in Willesden would seem to augur

fairly an extension of the present success to all mothers in the community. Increase in the hospital accommodation for confinements, increased attention to improving the fitness of the mother for childbirth and nursing the baby by adequate feeding, and greater attention paid to the new-born child, particularly premature infants, through the addition of a paediatrician attached to the institution, are three recommendations made in the memorandum by the Medical Officer of Health, Dr. George F. Buchan. These are said to offer no insurmountable administrative difficulties. The provision of a further period for recuperation through arrangements for convalescent care is desirable, but here other considerations enter the picture.

In Dr. Walker's report covering 3,000 cases, the essential details are provided for complicated cases, and in all cases involving any operative or instrumentative interference. In order that the full value of this data may be appreciated, however, it would be desirable to submit all information to careful statistical analysis. All factors known to influence the outcome of pregnancy and childbirth, such as age of mother, order of pregnancy, etc., should be studied. It is hoped that this will be done because in such an approach lies the hope of finally establishing the fact that other variables in the two groups of cases (those "booked" at the Willesden Maternity Hospital, and mothers confined elsewhere) have not played a part in the favourable experience reported upon. Comparability of the two groups in respect to age, order of pregnancy, the general health, com-

plicating diseases, etc., should be clearly established. Certainly a rate of one per 1,000 is extraordinarily low—as low, indeed, as is often regarded as the "irreducible minimum" or as the "natural risk" in pregnancy and childbearing.

The details provided concerning complications of pregnancy, instrumentation, and operative procedures, type of presentation at the onset of labour and others are clinical facts of great importance, and it is just this type of information on a large scale which is so much needed at the present time. In about 5 per cent. of the "booked" cases, forceps were used, while in 7 per cent. either forceps, induction, version or Caesarean section were employed. By contrast, among 192 fatal delivered cases in Ontario in 1933, 54 per cent. were delivered by such methods. In 68, or 2.3 per cent. of the cases, presentation at the onset of labour was breech, while approximately 90 per cent. were vertex anterior cases.

It is of interest to note that the stillbirth rate of 30 per 1,000 among "booked" cases is not significantly different from general experience. In other words, little has as yet been accomplished in this respect. This adds weight to the recommendations referred to above.

This memorandum and clinical report of the Willesden Maternity Hospital will deserve careful study. The results obtained and the findings reported in the memorandum are worthy of consideration by those concerned with the nature of a constructive program of maternal welfare in Canada.—*A. Hardisty Sellers, B.A., M.D., D.P.H.*

ASSOCIATION NEWS

OTTAWA, THE CONVENTION CITY

ANNOUNCEMENT of the holding of the twenty-sixth annual meeting of the Canadian Public Health Association in Ottawa on June 17th to 19th, in conjunction with the twenty-third annual meeting of the Ontario Health Officers Association, has been received enthusiastically by the members of both organizations. The combination of natural advantages and

the history of the river and the two are inseparable. For more than one hundred years Ottawa has been spreading gradually over its hills, high above the waters of the river from which it took its name, and for three hundred years the river has been an integral part of the history of Canada. Originally known as the Grand River, it was first explored by Champlain in



CONVENTION HEADQUARTERS: THE CHATEAU LAURIER

national sentiment that makes the capital city the headquarters for so many national societies makes it ideal for such a meeting.

The history of many of the world's capitals is interwoven with the history of the rivers on whose banks they stand. London and the Thames, Paris and the Seine, Rome and the Tiber, Washington and the Potomac—divorce any from its river and much is lost. This is true also of Ottawa. The history of the town grew out of

1613 when he paused on Ottawa's site to admire its promontories and seething waterfalls. In a few years the river became the fur-trade route to the west and north.

Unheard of for two centuries, Ottawa again figured in the history of Canada in 1826 as the eastern terminus of a military canal constructed from Lake Ontario to the Ottawa River. This canal, the Rideau, was built by a company of Royal Engineers under the direction of Colonel

John By, after whom the settlement was called. In 1854 the name Bytown was changed to Ottawa and three years later the city was chosen by Queen Victoria as the Capital of Canada. Ottawa's development has been twofold: on the one hand the growth of the country has necessitated

from the Ottawa River and is comprised of twenty-seven and three-quarters acres. As one approaches the city by railway or automobile, the sky-piercing Peace Tower of the Houses of Parliament attracts the eye before any other part of the city is visible. The Parliament House and



PARLIAMENT BUILDINGS

the expansion of the Government services; on the other, due to the great water power available, several industrial plants have grown to vast proportions.

Almost surrounded by thirty miles of scenic driveway, Ottawa has wide streets bordered by magnificent trees, beautiful homes, and stately buildings, both governmental and industrial. The city is dominated by the splendid Gothic buildings on the summit of Parliament Hill, which rises more than one hundred and fifty feet

the Departmental Buildings, on three sides of a square, are exceedingly effective in colour and in perfection of detail. Originally built between 1859 and 1865, the three buildings remained unchanged for a decade, when the Mackenzie Tower was added to the West Block. With the exception of the beautiful octagonal Library of Parliament, the Central Block containing the House of Commons, the Senate, etc., was destroyed by fire in February, 1916. It was rebuilt on a somewhat larger scale and with a

higher tower, now known as the Peace Tower, with its famous carillon of fifty-three bells. The East and West Blocks, also Gothic in design, are used for departmental purposes.

fought and died; the marble border was the gift of the Belgian Government, and the beautiful white stone from the Chateau Gaillard was presented by the Government of France.



THE MEMORIAL CHAMBER AND THE ALTAR OF REMEMBRANCE

In the Central Block is the Memorial Chamber, the nation's tribute to its heroic dead, with its Altar of Remembrance within which is to be preserved a book containing the names of the Canadian men and women who gave their lives during the Great War. Stone for the floor of the Chamber was brought from those parts of France and Belgium where Canadian soldiers

Great Britain supplied the huge block from which the altar was carved. Years of rare craftsmanship have gone into the work and the effect is one of impressive dignity and simplicity. The Library of Parliament is one of the finest examples of Gothic architecture in existence and contains more than 400,000 books and pamphlets.

The National Museum of Canada

and the National Art Gallery are located in the Victoria Memorial Museum building. The National Museum is the Dominion Government's repository for collections representing the culture of the Indians and Eskimos, Canadian fauna and flora, and the natural sciences. The National Gallery, founded in 1880, contains the most important collection of works of art in Canada and in many respects is one of the best on this continent. Its collection of Canadian art

The Dominion Archives' Library contains from 75,000 to 100,000 printed books and 10,000 pamphlets pertaining to Canadian history, together with almost 200,000 volumes of manuscripts, prints, engravings, and manuscript plans of Canada with the original surveys of the country. Bytown Museum has a most interesting collection of relics of the early days of Ottawa. The Royal Mint is open for inspection by appointment.



THE HOUSE OF COMMONS

is the most complete and representative in existence.

The Central Experimental Farm, headquarters of the Dominion Experimental Farms, has an area of eight hundred and twenty-five acres. The preliminary work of research and experiment is originated in its fourteen divisions and is extended in its more practical aspects to the Branch farms and stations throughout the Dominion. The Dominion Observatory is entered through the Experimental Farm. In nearby Hull, Quebec, is located the Animal Diseases Research Institute of the Dominion Department of Agriculture. Beside the historic Rideau Falls are the Laboratories of the Research Council of Canada.

Other points of special interest to the membership include Ottawa's Department of Health under the direction of Dr. T. A. Lomer; the Dominion Bureau of Statistics; the Water Purification Plant on Lemieux Island; and the Laboratory of Hygiene, Department of Pensions and National Health.

In addition to such advantages as accessibility, adequate hotel accommodation, and exceptional opportunities for sight-seeing, the facilities for obtaining first-hand information on every phase of public health and preventive medicine make Ottawa an outstanding city for the annual meeting of the two associations.

BOOKS AND REPORTS

Eugenical Sterilization. *The Committee of the American Neurological Association for the Investigation of Eugenical Sterilization. Published by the Macmillan Co. of Canada, 70 Bond Street, Toronto, 1936. 211 pages. Price \$3.00.*

AN extensive literature, pro and con, has accumulated on sterilization and its place in the present social scheme. The mirage created in the minds of many, even intelligent men and women, of the growing volume of mental disease and defect has been an unfortunate outcome of failure to appreciate clearly the factors which have been and still are operating to create an increase in the *recorded* mental cases. For years we have been stormed with loose claims about "racial suicide" and degeneracy, but we find little evidence to support such pessimistic claims. Enthusiasts have talked of sterilization of the mentally unfit as a quack talks of his "cure-all", apparently having convinced themselves that it offers a convenient solution to their problem—not proved to date—of the increasing proportion of the population mentally diseased or defective, declaring that the mentally unfit are reproducing at an alarming rate and will soon inherit the earth, despite substantial evidence that both fundamentals of their thesis are quite unsound and in fact quite untrue.

In May 1934 the American Neurological Association appointed a committee to review the whole problem of mental disease and defect and consider the status of our present knowledge in relation to sterilization of the unfit as a means of control. This committee under the chairmanship of Dr. Abraham Myerson presented a preliminary report in 1935. Not the first scientific contribution of its kind in this field, it nevertheless possessed many unique features to commend it to all scientific observers of social problems and particularly to all those

specifically interested in the problem of mental defect and illness. The wide and enthusiastic reception which attended the presentation of the report indicated that it was advisable to publish the material in extended and permanent form.

The objective was to examine critically the available data on the inheritance of mental disease, feeble-mindedness, epilepsy and crime, and to evaluate them objectively. The main arguments in favour of sterilization are examined in detail and it is pointed out that "there is nothing to indicate that mental disease and defect are increasing." The apparent increase in mental cases can be explained merely by the increase in commitment rate due to increased facilities for accommodation and treatment, and better facilities, as well as to a changed attitude toward mental institutions in general. Furthermore, "the reported high fecundity and fertility of the mental defective group is a myth, based on the assumption that those who are low in the cultural scale are also mentally and biologically defective."

A substantial section of the book is devoted to studies on the inheritance of mental disease and other sections relate to existing legislation for sterilization, the relation of genetics and eugenics, and finally the recommendations of the Committee.

An extensive list of references occupying 20 pages is a useful provision.

A. H. Sellers

Snow on Cholera. *John Snow, M.D. Published by the Commonwealth Fund, 41 East 57th Street, New York City, 1936. 191 pages. Price \$2.50.*

DR. SNOW "was a pioneer in modern epidemiology. His brilliant investigations of the method of transmission of cholera commands admiration not only

as a monumental achievement for his time but also as a model of patient and clear-sighted search for the ways in which disease is spread."

There is no student in any field of public health who is not acquainted, at least in part, with John Snow's work and writings on cholera. Two of his papers, certainly, may be regarded as classics and these, "On the Mode of Communication of Cholera" and "On Continuous Molecular Changes", have been republished in this book.

The republication of these two papers by Dr. John Snow will be very much appreciated by epidemiologists, especially since only a few of the original copies exist and it has been very difficult for post-graduates in public health to secure access to them. These, as Dr. Frost says, "should be read once as a story of exploration, many times as a lesson in epidemiology." The republication of these outstanding papers was suggested to the Commonwealth Fund by Delta Omega, honorary professional society in public health.

A biographical memoir by B. W. Richardson, M.D., and an introduction by W. H. Frost, M.D., add substantially to the wide interest which this volume will undoubtedly attract. Reference is made to Dr. Snow's other writings in the appendix to this volume where a bibliography of his principal writings is also to be found.

A. H. Sellers

A Short History of Tuberculosis.

G. Norman Meacher, M.D., B.S., M.R.C.P., Consulting Physician (for Tuberculosis), Southend Municipal Hospital; Tuberculosis Officer, County Borough of Southend-on-Sea. Published by John Bale, Sons & Danielson, Ltd., London, W. 1, 1936. 105 pages, 4 illustrations. 3s. 6d.

The story of tuberculosis traced from the very oldest evidence of its existence to the present time is an exceedingly interesting one. This review of the history of tuberculosis is

a worthy contribution to medical literature. The division of subject matter is excellent, the historical background of the various aspects of the disease such as pathology, therapeutics and control being developed in succeeding chapters.

It is always well to pause from time to time to survey the path by which we have come. The author has done this for us in the case of tuberculosis, showing the slow, stumbling progress of human effort, the difficulties and opposition overcome and, most important, the need for "new paths and fresh outlooks" for the future.

F. O. Wishart

Manual of Public Health: Laboratory Practice. J. R. Currie, Henry Meachan Professor of Public Health, University of Glasgow, and contributors. Published by the Macmillan Company of Canada, 70 Bond Street, Toronto, 1936. 361 pages. 169 illustrations. Price \$6.25.

THIS book has been designed for the use of candidates for the Diploma in Public Health at the Institute of Hygiene in the University of Glasgow. It is divided into six sections: Chemistry, Bacteriology and Meteorology, by Professor Currie; Protozoology, by Dr. A. G. Mearns, Lecturer in Public Health; Helminthology, by Miss Margaret W. Jepps; and Entomology, by Dr. Robert A. Staig. Miss Jepps and Dr. Staig are both lecturers in Zoology and all are of the University of Glasgow.

In order to compress subjects of this nature into short space, something must be sacrificed. It appears, therefore, to have been assumed, particularly in respect of the biological sections, that the reader has access to more detailed publications under the sectional headings wherein he may obtain information as to the control of the parasites and their vectors. It is true that this may not be in the laboratory worker's province but it is expected from the Diplomate in Public

Health. The tables and pen-and-ink drawings are well selected and clear, although a greater number might with profit have been included under Entomology. An unusual system of appropriate cross-references at the bottom of the page affords the reader most useful assistance and serves to avoid repetition in the text. In general this book should be a useful reference manual for those who have previously had practical training in the respective subjects and may require technical refreshment of the memory.

P. A. T. Sneath

Report of the Board of Governors of the Victorian Order of Nurses for Canada for 1935. *Published by the V.O.N. for Canada, 311 Transportation Building, Ottawa, 1936. 43 pages.*

THE outstanding contribution being made toward the preservation of maternal and infant health by the Victorian Order of Nurses for Canada is recognized by those who have worked with the organization or utilized the services available through it. The full significance and virtues of the Order are, however, not as widely known or appreciated as they should be, and this can be attributed to a combination of public inertia and inadequate publicity. The remedy lies in well-directed public health education, and the report for the year 1935 indicates that plans have been laid and substantial efforts already made in this direction.

This report of the 38th annual meeting of the Victorian Order of Nurses for Canada gives a concise review of the year's activities. At the end of the year there were 318 nurses on the staff and during the year 751,350 visits were made to 85,374 patients. It is pointed out that "there is still abundant evidence that many people do not take full advantage of the nursing service, even though it is available, because of not being fully informed regarding the various types of care provided by the Order." On this

account, the obvious need for local publicity is stressed.

The distribution of the services rendered indicates the type of care given to the patients visited—maternal and infant welfare, 54.9 per cent; general nursing, 33.2 per cent; health education, 11.7 per cent. The nursing care provided by the Order is continued only under medical direction and it is therefore interesting to note that of the calls made to the organization, the patient or family contributed 55.8 per cent, physicians 24.8 per cent, and hospitals and other agencies 8.0 per cent. The fully paid visits made constituted only 9.7 per cent of the total, insurance visits 17.5 per cent, part-paid visits 14.2 per cent, and free visits 58.5 per cent.

The report of the Chief Superintendent, Miss Elizabeth L. Smellie, is of special interest. Besides a general inventory of the year's work—extracts of which have been given above, the report gives a clear and critical résumé of the present status of the problems of the Order and of the whole field of nursing service in general. It is a highly constructive and open-minded report to which much reflection may well be given by all nursing groups and directors, and all municipal health officers.

At the moment the true benefits of the services provided by the Order cannot be presented statistically. In respect to maternal welfare services, the maternal death rate in itself is an inadequate measure, but this alone is not the sole disadvantage in presenting the maternal death rates which appear in this report. By virtue of the type of service provided by the Order, the maternal death rate, as ordinarily computed, cannot directly be compared with general experience in Canada, though this is the very thing that many people do. It is desirable, therefore, that specific death rates by cause be presented or that an appropriate correction factor be applied to correct for abortions, etc., which cases, of

necessity, do not form part of the group attended by the V.O.N. The former procedure is to be preferred.

The Order is to be complimented on the scope and content of the report and it is hoped that in future a summary analysis, at least, of the field experience in respect to maternal, foetal and neonatal mortality along the lines suggested above, will form part of the report or be separately published.

A. H. Sellers

Research in Dementia Praecox.

Nolan D. C. Lewis, M.D. Published by the National Committee for Mental Hygiene, New York City, 1936. 320 pages. Price \$1.50.

IN 1934 the Supreme Council of the Thirty-Third Degree Scottish Rite Masons of the Northern Jurisdiction of the United States of America donated funds to promote research into the causation of dementia praecox, this research to be carried out under the supervision of the National Committee for Mental Hygiene. Dr. Lewis, the author of this book, is the field representative and co-ordinator of this study and as a foundation for this work he has attempted to gather into one volume our available knowledge on the subject. Two hundred laboratories were visited and the literature on the subject published between 1920 and 1934, including some 1,778 papers, reviewed. The author has attempted to examine this knowledge critically and to suggest the leads which he feels most profitable in research in this field.

The fact that almost one-quarter of all hospital beds in America, both mental and general, are occupied by persons suffering from this condition gives some idea of dementia praecox and helps one to appreciate the importance of this book. It is a condition which is very poorly understood. For

these reasons this book has been reviewed in greater detail than is customary.

At the outset the author points out that there is no generally accepted criteria as to what constitutes dementia praecox. This is due to the fact that its etiology is unknown and the diagnosis dependent upon the clinical picture. Most psychiatrists agree that dementia praecox usually occurs in an individual of a definite type of personality make-up, i.e., those of the shy, reserved, day-dreaming, retiring type—the so-called shut-in or introverted personality.

The author describes in detail the types of cases that he believes should be classified under the various subgroups: simple, hebephrenic, catatonic, and paranoid dementia praecox. He points out that psychology has aided in our understanding of the condition, viewing it not as a disease process but as a progression of the personality described above, leading to a gradual withdrawal of interest from the real things of life until the patient becomes completely occupied with his own dreams and phantasies.

The author believes that the recent development of recording changes of electrical potential in the brain by the use of electrodes applied to the scalp may be a fruitful line of research.

This is a book for which there is a great need and one which should be in the library of everyone interested in mental disorders. The only shortcoming of this book is one that is inevitable in any treatise of this type. The contents represent what, in the opinion of the author and his advisers, is important in the recent literature and investigations on this subject. Other psychiatrists might stress other findings as being equally important.

G. E. Hobbs

CURRENT HEALTH LITERATURE

These abstracts are intended to direct attention to articles that have appeared in other journals during the past month. Any of the journals referred to may be borrowed for three days or longer if desired. Address requests to the secretary of the Editorial Board.

Recent Advances in the Control of Pneumonia

THE AUTHOR urges the importance of establishing an early diagnosis in lobar pneumonia in terms of the causative organism. Since 1913 Type I pneumonia cases admitted to the Hospital of the Rockefeller Institute have been treated with type-specific serum. Compared with a general mortality rate of 25 per cent., the rate for those receiving serum in the first 3 days was 4.8 per cent.; 4th day or earlier, 8.2 per cent.; 5th day or earlier, 8.6 per cent.; and after the 5th day, 19.5 per cent. Serum should be administered to all Type I cases except convalescents regardless of the time interval. (Specific serum therapy in Types II, VII and VIII cases has also been encouraging.)

Measures whereby physicians and public health authorities may cooperate in the control of lobar pneumonia are outlined.

Rufus Cole, *Am. J. Pub. Health*, 1936, 26: 1191.

Clinical and Laboratory Investigation on Volunteers Infected with Pfeiffer's Bacillus

EIGHTY healthy volunteers were given large intranasal doses of Pfeiffer's bacillus. All developed a more or less typical influenza symptomatology but the blood picture was the reverse of that found in epidemic influenza and the condition was not infectious.

A. A. Smorodinsteff, A. I. Drobyshchakaya, S. M. Ostrovskaya, and O. I. Shishkina, *Lancet*, 1936, 231: 1381.

On the Etiology of the 1936 Influenza Epidemic in Leningrad

FROM A number of cases during the severe outbreak of epidemic influenza in 1936 in Leningrad the authors recovered a virus which they consider

identical with that isolated by Smith, Andrewes and Laidlaw in England. Specific virulicidal properties in the blood of influenza patients increased markedly during convalescence.

A. A. Smorodinsteff, A. I. Drobyshchakaya, S. M. Ostrovskaya, and O. I. Shishkina, *Lancet*, 1936, 231: 1383.

The Efficiency of Rapid Sand Filters in Removing the Cysts of the Amoebic Dysentery Organisms from Water

THE AUTHORS have repeated their previous small-scale experiments using much larger filters and have confirmed the former results. They conclude that filtration of water through rapid sand filters is a highly efficient method of removing the cysts of *Endamoeba histolytica* from water.

John R. Baylis, Oscar Gullans and Bertha Kaplan Spector, *U.S. Pub. Health Rep.*, 1936, 51: 1567.

Influenza Mortality in the United States, 1936

VARIOUS parts of the United States experienced an epidemic of influenza during 1936 with the number of cases and the mortality well above normal expectancy. Mortality, however, did not reach extreme proportions in any section. The situation existing up to September 19th did not foreshadow any great outbreak of the disease in a serious form for the winter of 1937.

U.S. Pub. Health Rep., 1936, 51: 1399.

Paralytic and Nonparalytic (Pre-paralytic) Poliomyelitis

TWO STATES, Massachusetts and Tennessee, have instituted a classification for reporting cases of poliomyelitis whereby the number of cases of the nonparalytic type, which are included in the total reported for that disease, will be stated in the weekly reports.

Because of the difficulty in recognition of nonparalytic poliomyelitis, it is felt that only the paralytic cases should be counted in recording and comparing intensity of spread of the disease.

U.S. Pub. Health Rep., 1936, 51: 1556.

